COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DRAFT PERMIT *April 30, 2019*
TO WITHDRAW GROUNDWATER IN THE
EASTERN SHORE GROUNDWATER MANAGEMENT AREA

Permit Number: GW0072600
Effective Date: Xxxxxxx XX, 2019
Expiration Date: Xxxxxxx XX, 2034

Pursuant to Section 62.1-256 of the Ground Water Management Act of 1992 (Chapter 25, Title 62.1 of the Code of Virginia) and the Groundwater Withdrawal Regulations (Regulations) (9VAC25-610-10 *et seq*.), the State Water Control Board (Board) hereby authorizes the Permittee to withdraw and use groundwater in accordance with this permit.

Permittee Ryan Brady

Facility Brady Farms

Facility Address 0 New Branch Road

Greenbush, Virginia 23357

The Permittee's authorized groundwater withdrawal shall not exceed:

9,900,000 gallons per year,
2,700,000 gallons per month.

The permitted withdrawal will be used to provide an agricultural water supply. Other uses are not authorized by this permit.

The Permittee shall comply with all conditions and requirements of the permit.

By direction of the State Water Control Board, this Permit is granted by:

Signed_____ Date _____

Director, Office of Water Supply

This permit is based on the Permittee's application submitted on July 7, 2017, and subsequently amended to include supplemental information provided by the Permittee. The following are conditions that govern the system set-up and operation, monitoring, reporting, and recordkeeping pertinent to the Regulations.

Part I
Operating Conditions

A. Authorized Withdrawal

1. The withdrawal of groundwater shall be limited to the following wells identified in the table below. Withdrawals from wells not included in Table 1 are not authorized by this permit and are therefore prohibited. 9VAC25-610-140.A

Table 1

Owner Well Name	DEQ Well #	Well Depth (ft)	Screen Intervals	Aquifer	Latitude	Longitude	Datum
Well 1	100-01363	150	135-150	Upper Yorktown-Eastover	37° 44' 25.68"	-75° 41' 54.40"	WGS84
Well 2	100-01364	150	135-150	Upper Yorktown-Eastover	37° 44' 25.12"	-75° 41' 54.84"	WGS84
Well 3	100-01365	150	135-150	Upper Yorktown-Eastover	37° 44' 24.52"	-75° 41' 55.32"	WGS84
Well 4	100-01366	150	135-150	Upper Yorktown-Eastover	37° 44'23.94"	-75° 41' 55.76"	WGS84
Well 5	100-01367	160	135-150	Upper Yorktown-Eastover	37° 44' 23.32"	-75° 41' 56.18"	WGS84
Well 6	100-01368	160	145-160	Upper Yorktown-Eastover	37° 44' 24.86"	-75° 42' 04.93"	WGS84
Well 7	100-01369	160	150-160	Upper Yorktown-Eastover	37° 44' 23.20"	-75° 42' 06.18"	WGS84
Well 8	100-01370	160	145-160	Upper Yorktown-Eastover	37° 44' 22.31"	-75° 42' 06.84"	WGS84

2. Any actions that result in a change to the well operation, construction, or pump intake setting of wells included in this permit must be pre-approved by the Department of Environmental Quality (Department) in writing prior to implementing the change and a revised GW-2 Form must be submitted to the Department within 30 days after the physical construction of a well is altered or the pump intake setting has been changed. If changes are a result of an emergency, notify the Department within 5 days from the change. 9VAC25-610-140.C

B. Pump Intake Settings

1. The Permittee shall not place a pump or water intake device lower than the top of the uppermost confined aquifer that a well utilizes as a groundwater source or lower than the bottom of an unconfined aquifer that a well utilizes as a groundwater source in order to prevent dewatering of the aquifer, loss of inelastic storage, or damage to the aquifer from compaction. 9VAC25-610-140.A.6

2. Pump settings in individual wells are limited as follows. Any change in the pump setting must receive prior approval by the Department.

Owner Well Name	DEQ Well #	Max Pump Setting (feet below land surface)
Well 1	100-01363	75
Well 2	100-01364	75
Well 3	100-01365	75
Well 4	100-01366	75
Well 5	100-01367	75
Well 6	100-01368	90
Well 7	100-01369	90
Well 8	100-01370	90

C. Reporting

1. Water withdrawn from each well shall be recorded consistently at the end of each month and reported to the Office of Water Supply, in paper or electronic format, on a form provided by the Department by the tenth (10^{th}) day of each January, April, July and October for the respective previous calendar quarter. Records of water use shall be maintained by the Permittee in accordance with Part III.F, 1 through 5 of this permit. 9VAC25-610-140.A.9

2. The Permittee shall report any amount in excess of the permitted withdrawal limit by the fifth (5th) day of the month following the month when such a withdrawal occurred. Failure to report may result in compliance or enforcement activities. 9VAC25-610-140.C

3. The following is a summary of reporting requirements for specific facility wells:

Owner Well Name	DEQ Well #	Reporting Requirements
Well 1	100-01363	Water Use
Well 2	100-01364	Water Use
Well 3	100-01365	Water Use
Well 4	100-01366	Water Use
Well 5	100-01367	Water Use
Well 6	100-01368	Water Use
Well 7	100-01369	Water Use
Well 8	100-01370	Water Use

D. Water Conservation and Management Plan

1. The Water Conservation and Management Plan (WCMP) submitted in the application received July 07, 2017 and subsequently amended and then approved by the Department is incorporated by reference into this permit and shall have the same effect as any condition contained in this permit and may be enforced as such.

2. By the end of the first year of the permit cycle [*date*] the Permittee shall submit a detailed description of their leak detection and repair program activities and documentation to the Department that these activities have been conducted. This documentation shall include frequency of the activities completed and the findings and results of the activities during the first year of the permit term. 9VAC25-610-100.B.1.b,2.b,or 3.b

3. As soon as completed but not later than the end of the second year of the permit cycle [*date*], the Permittee shall submit to the Department results of a 12 month audit of the total amount of groundwater used in the distribution system and the separate amounts used for drinking and cooling. This audit report shall include the flock cycle start and end dates during the year, and any necessary changes to the leak detection and repair program or operations that affected water use. 9VAC25-610-100.B.1.b,2.b,or 3.b

4. A report on the plan's effectiveness in maintaining or reducing water use and a summary of proposed revisions to the WCMP to address any elements that can be improved based on operations to date shall be submitted by the end of years five [*date*] and ten [*date*] of the permit term. These reports shall include as appropriate: 9VAC25-610-140.C

    a. Any new water saving equipment installed or water saving processes adopted;
    b. A summary of the operation of the cooling system for the houses during the report period including what months the cooling system was operated;
    c. Evaluation of the leak detection and repair program with a summary of any significant leaks found and repaired; and
    d. A summary of the flock cycles and overall water use patterns for each year covered by the report.

5. If revisions or additions to the plan are necessary an updated WCMP shall be submitted to the Department for approval along with the report prior to implementation of the revised plan

6. Records of activities conducted pursuant to the WCMP are to be submitted to DEQ upon request.

E. Mitigation Plan

The Mitigation Plan approved on June 18, 2018 by the Department is incorporated by reference into this permit and shall have the same effect as any condition contained in this permit and may be enforced as such. 9VAC25-610-110.D.3.g

F. Well Tags

1. Each well that is included in this permit shall have affixed to the well casing, in a prominent place, a permanent well identification plate that records, at a minimum, the DEQ well identification number, the groundwater withdrawal permit number, the total depth of the well, and the screened intervals in the well. Such well identification plates shall be in a format specified by the Board and are available from the Department. 9VAC25-610-140.A.12

2. Well tags shall be affixed to the appropriate well casing within 30 days of receiving the tags from the Department. The accompanying well tag installation certification form shall be returned to the Department within 60 days of receipt of the tags. 9VAC25-610-140.C

Part II
Special Conditions

Pursuant to 9VAC25-610-140.B and C, the following Special Conditions apply to this permit in order to protect the public welfare, safety, and health or conserve, protect and help ensure the beneficial use of groundwater.

A. Pump Intake Determination and Reset

Within four years of permit issuance (September 30, 2023), the Permittee shall ensure the pump intake for each well is at or above the stated maximum pump setting as provided in feet below land surface (ft. bls). The Permittee shall advise DEQ, in writing, of the new pump setting within 30 days of the modification.

Owner Well Name	DEQ Well #	Max Pump Setting (feet below land surface)
Well 1	100-01363	75
Well 2	100-01364	75
Well 3	100-01365	75
Well 4	100-01366	75
Well 5	100-01367	75
Well 6	100-01368	90
Well 7	100-01369	90
Well 8	100-01370	90

B. Meter Installation Verification/Correction

If notified by DEQ through an inspection report that meters meeting the requirements set forth in Part III Condition I of this permit have not been correctly installed on each production well in such a manner as to record total withdrawals from the well including both cooling water and drinking water, the Permittee shall correct any identified meter issues within 60 days of notification.

Part III
General Conditions

A. Duty to Comply

The Permittee shall comply with all conditions of the permit. Nothing in this permit shall be construed to relieve the permit holder of the duty to comply with all applicable federal and state statutes, regulations and prohibitions. Any permit violation is a violation of the law and is grounds for enforcement action, permit termination, revocation, modification, or denial of a permit application. 9VAC25-610-130.A

B. Duty to Cease or Confine Activity

It shall not be a defense for a Permittee in an enforcement action that it would have been necessary to

halt or reduce the activity for which a permit has been granted in order to maintain compliance with the conditions of the permit. 9VAC25-610-130.B

C. Duty to Mitigate

The Permittee shall take all reasonable steps to avoid all adverse impacts that may result from this withdrawal as defined in 9VAC25-610-10 and provide mitigation of the adverse impact when necessary as described in 9VAC25-610-110.D.3.g. 9VAC25-610-130.C

D. Inspection, Entry, and Information Requests

Upon presentation of credentials, the Permittee shall allow the Board, the Department, or any duly authorized agent of the Board, at reasonable times and under reasonable circumstances, to enter upon the Permittee's property, public or private, and have access to, inspect and copy any records that must be kept as part of the permit conditions, and to inspect any facilities, well(s), water supply system, operations, or practices (including sampling, monitoring and withdrawal) regulated or required under the permit. For the purpose of this section, the time for inspection shall be deemed reasonable during regular business hours. Nothing contained herein shall make an inspection time unreasonable during an emergency. 9VAC25-610-130.D

E. Duty to Provide Information

The Permittee shall furnish to the Board or Department, within a reasonable time, any information that the Board may request to determine whether cause exists for modifying or revoking, reissuing, or terminating the permit, or to determine compliance with the permit. The Permittee shall also furnish to the Board or Department, upon request, copies of records required to be kept by regulation or this permit. 9VAC25-610-130.E

F. Monitoring and Records Requirements

1. The Permittee shall maintain a copy of the permit on-site and/or shall make the permit available upon request. 9VAC25-610-130.E

2. Monitoring of parameters shall be conducted according to approved analytical methods as specified in the permit. 9VAC25-610-130.F.1

3. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. 9VAC25-610-130.F.2

4. The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart or electronic recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit, for a period of at least three years from the date of the expiration of a granted permit. This period may be extended by request of the Board at any time. 9VAC25-610-130.F.3

5. Records of monitoring information shall include as appropriate: 9VAC25-610-130.F.4

a. the date, exact place and time of sampling or measurements;

b. the name(s) of the individual(s) who performed the sampling or measurements;

c. the date the analyses were performed;

d. the name(s) of the individual(s) who performed the analyses;

e. the analytical techniques or methods supporting the information, such as observations,

f. readings, calculations and bench data used;

g. the results of such analyses; and

h. chain of custody documentation.

G. Environmental Laboratory Certification

The Permittee shall comply with the requirement for certification of laboratories conducting any tests, analyses, measurements, or monitoring required pursuant to the State Water Control Law (§ 62.1-44.2 et seq.), Environmental Laboratory Certification Program (§ 2.2-1105et seq.), Certification for Noncommercial Environmental Laboratories (1VAC30-45), and/or Accreditation for Commercial Environmental Laboratories (1VAC30-46), and

a. Ensure that all samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

b. Conduct monitoring according to procedures approved under 40CFR Part 136 or alternative methods approved by the U.S. Environmental Protection Agency.

c. Periodically calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals that will ensure accuracy of measurements. (1VAC30-45-20)

H. Future Permitting Actions

1. A permit may be modified or revoked as set forth in Part VI of the Regulations. 9VAC25-610-290 and 9VAC25-610-130.G

2. If a Permittee files a request for permit modification or revocation, or files a notification of planned changes, or anticipated noncompliance, the permit terms and conditions shall remain effective until the Board makes a final case decision. This provision shall not be used to extend the expiration date of the effective permit. 9VAC25-610-130.G

3. Permits may be modified or revoked upon the request of the Permittee, or upon Board initiative, to reflect the requirements of any changes in the statutes or regulations. 9VAC25-610-130.G

4. The Permittee shall schedule a meeting with the Department prior to submitting a new, expanded or modified permit application. 9VAC25-610-85

5. A new permit application shall be submitted 270 days prior to the expiration date of this permit, unless permission for a later date has been granted by the Board, to continue a withdrawal greater than or equal to 300,000 gallons in any month while an application for a renewal is being processed. 9VAC25-610-96

6. A new permit application shall be submitted 270 days prior to any proposed modification to this permit that will (i) result in an increase of withdrawal above permitted limits; or (ii) violate the terms and conditions of this permit. 9VAC25610-96

7. The applicant shall provide all information described in 9VAC25-610-94 for any reapplication. 9VAC25-610-96.C

8. The Permittee must notify the Department in writing of any changes to owner and facility contact information within 30 days of the change. 9VAC25-610-140.C

I. Metering and Equipment Requirements

1. Each well and/or impoundment or impoundment system shall have an in-line totalizing flow meter to read gallons, cubic feet, or cubic meters installed prior to beginning the permitted use. Meters shall produce volume determinations within plus or minus 10% of actual flows. 9VAC25-610-140.A.7.b

    a. A defective meter or other device must be repaired or replaced within 30 days.

    b. A defective meter is not grounds for not reporting withdrawals. During any period when a meter is defective, generally accepted engineering methods shall be used to estimate withdrawals. The period during which the meter was defective must be clearly identified in the groundwater withdrawal report required by Part I, Subsection D of this permit. An alternative method for determining flow may be approved by the Board on a case-by-case basis.

2. Each well shall be equipped in a manner such that water levels can be measured during pumping and non-pumping periods without dismantling any equipment. Any opening for tape measurement of water levels shall have an inside diameter of at least 0.5 inches and be sealed by a removable plug or cap. The Permittee shall provide a tap for taking raw water samples from each permitted well. 9VAC25-610-140.A.7.e

J. Minor Modifications

1. A minor modification to this permit must be made to replace an existing well(s) or add an additional well(s) provided that the well(s) is screened in the same aquifer(s) as the existing well(s), and is in the near vicinity of the existing well(s), the total groundwater withdrawal does not increase, the area of impact does not increase, and the well has been approved by the Department prior to construction. 9VAC25-610-330.B.4 and 5

2. A minor modification to this permit must be made to combine withdrawals governed by multiple permits when the systems are physically connected as long as interconnection will not result in additional groundwater withdrawal and the area of impact will not increase. 9VAC25-610-330.B.6

3. Minor modifications to this permit must also be made to:

    a. Change an interim compliance date up to 120 days from the original compliance date, as long as the change does not interfere with the final compliance date. 9VAC25-610-330.B.7

    b. Allow for change in ownership when the Board determines no other change in the permit is necessary and the appropriate written agreements are provided in accordance with the transferability of permits and special exceptions. 9VAC25-610-320 and 9VAC25-610-330.B.8

    c. Revise a Water Conservation and Management Plan to update conservation measures being implemented by the Permittee that increase the amount of groundwater conserved. 9VAC25-610-330.B.9

K. Well Construction

At least 30 days prior to the scheduled construction of any well(s), the Permittee shall notify the Department of the construction timetable and receive prior approval of the well(s) location(s) and acquire the DEQ Well number. All wells shall be constructed in accordance with the following requirements.

1. A well site approval letter or well construction permit must be obtained from the Virginia Department of Health prior to construction of the well. 9VAC25-610-130.A

2. A complete suite of geophysical logs (Spontaneous Potential, Single Point Resistance, 16/64 Short and Long Normal, Natural Gamma) shall be completed for the well and submitted to the Department along with the corresponding completion report. 9VAC25-610-140.C

3. The Permittee shall evaluate the geophysical log and driller's log information to estimate the top of the target aquifer and; therefore, a depth below which the pump shall not be set. The Permittee's determination of the top of the target aquifer shall be submitted to the Department for review and approval, or approved on site by the Department's Groundwater Characterization staff, prior to installation of any pump. 9VAC25-610-140.A.6

4. The Permittee shall install gravel packs and grout in a manner that prevents leakance between aquifers. Gravel pack shall be terminated close to the top of the well screen(s) and shall not extend above the top of the target aquifer. 9VAC25-610-140.C

5. A completed GW-2 Form and any additional water well construction documents shall be submitted to the Department within 30 days of the completion of any well and prior to the initiation of any withdrawal from the well. 9VAC25-610-140.C. The assigned DEQ Well number shall be included on all well documents. 9VAC25-610-140.C

6. In addition to the above requirements, construction of a Water Level Monitoring State Observation Well (SOW) requires:

    a. The Permittee shall coordinate activities with the Department's Groundwater

Characterization Program (GWCP) to determine the appropriate observation well location and construction schedule, along with the needed screen interval(s), and other completion details following review of geophysical logging. 9VAC25-610-140.C

b. Prior to preparation of bid documents for construction of the observation well, the Permittee shall notify the Department and shall include any GWCP requirements in the bid documents. At a minimum, the Department will require a pre-bid meeting with interested drilling contractors and a pre-construction meeting with the successful bidder. 9VAC25-610-140.C

c. Instrumentation to meet the requirements for real-time data transmission consistent with the State Observation Well Network shall be purchased by the Permittee. The Permittee shall submit a purchase order based on the Department's equipment specifications for review and approval prior to purchase of the equipment. The Permittee shall not be required to install the equipment. 9VAC25-610-140.C

7. In addition to the above requirements, construction of a Chloride Monitoring SOW requires:

a. The Permittee shall coordinate activities with the Department's Groundwater Characterization Program (GWCP) to determine the appropriate observation well location and construction schedule, along with the needed screen interval(s), and other completion details following review of geophysical logging. 9VAC25-610-140.C

b. Prior to preparation of bid documents for construction of the observation well, the Permittee shall notify the Department and shall include any GWCP requirements in the bid documents. At a minimum, the Department will require a pre-bid meeting with interested drilling contractors and a pre-construction meeting with the successful bidder. 9VAC25-610-140.C

c. Instrumentation to meet the requirements for real-time data transmission consistent with the State Observation Well Network shall be purchased by the Permittee. The Permittee shall submit a purchase order based on the Department's equipment specifications for review and approval prior to purchase of the equipment. The Permittee shall not be required to install the equipment. 9VAC25-610-140.C

d. Instrumentation to meet the requirements for continuous measurement of specific conductance from multiple levels within the well screen shall be purchased by the Permittee. The Permittee shall submit a purchase order based on the Department's equipment specifications for review and approval prior to purchase of the equipment. The Permittee shall not be required to install the equipment. 9VAC25-610-140.C

L. Permit Reopening

This permit may be reopened for the purpose of modifying the conditions of the permit as follows:

a. To meet new regulatory standards duly adopted by the Board. 9VAC25-610-140.A.11

b. When new information becomes available about the permitted withdrawal, or the impact of the withdrawal, which had not been available at permit issuance and would have justified the application of different conditions at the time of issuance. 9VAC25-610-310.B.1

c. When the reported withdrawal is less than 60% of the permitted withdrawal amount for a five year period. 9VAC25-610-310.B.2

d. If monitoring information indicates the potential for adverse impacts to groundwater quality or level due to this withdrawal. 9VAC25-610-140.C

COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

PERMIT ISSUANCE FACT SHEET

Groundwater Withdrawal Permit Number: GW0072600
Application Date: July 07, 2017

The Department of Environmental Quality (Department or DEQ) has reviewed the application for a Groundwater Withdrawal Permit. Based on the information provided in the application and subsequent revisions, DEQ has determined that there is a reasonable assurance that the activity authorized by the permit is a beneficial use as defined by the regulations. Groundwater impacts have been minimized to the maximum extent practicable. The following details the application review process and summarizes relevant information for developing the Permit and applicable conditions.

Permittee / Legal Responsible Party

Name & Address:	Ryan Brady PO Box 416 Atlantic, Virginia 23303
Phone:	(757) 894-4410

Facility Name and Address

Name & Address:	Brady Farms 0 New Branch Road Greenbush, Virginia 23357
Phone:	(757) 894-4410

Contact Information:

Name:	Ryan Brady
E-mail:	ryanlbrady81@gmail.com
Phone:	(757) 894-4410

Proposed Beneficial Use:

The proposed use for this withdrawal is for agriculture. Withdrawals will supply a poultry growing operation with water for cooling of chicken houses as well as for direct consumption by poultry.

Processing Dates

Processing Action	Date Occurred/Received
Pre-Application Meeting:	May 03, 2017
Application Received:	July 07, 2017
Permit Fee Deposited by Accounting:	Not Applicable
Notice of Deficiency Sent	November 07, 2017
Response to Notice of Deficiency Received:	December 15, 2017
Request for Additional Information Sent:	April 16, 2018
Response to Request for Additional Information Recevied:	June 15, 2018
Local Government Ordinance Form Received:	December 11, 2017
Application Complete:	June 18, 2018
Submit Request for Technical Evaluation:	December 18, 2018
Technical Evaluation Received:	February 12, 2019
Draft Permit Package Sent:	TBD
Submit Draft Permit for Public Notice:	TBD
Public Notice Published:	TBD
End of 30-Day Public Comment Period:	TBD
Response to Public comment:	TBD
Public Meeting or Hearing:	TBD

Application

Application Information

Brady Farm is a poultry farm owned by Ryan Brady and located in Accomack County. Brady Farm currently has eight poultry houses and eight production wells. The houses are all 67 feet by 660 feet. The farm produces broilers. Additional information on how water is used at the farm is discussed in the basis of need section of the fact sheet.

Construction on the poultry houses and wells began in 2017 and was completed 2018. The applicant coordinated with DEQ and geophysical logs were collected on three wells. DEQ geologists were on-site for the collection of logs and cuttings.

The construction of Brady Farm was covered under a General VPDES Permit for Discharges of Stormwater from Construction Activities (VAR10).

Location of Facility/Withdrawal:

Water Supply Planning Unit: Accomack & Northampton

County: Accomack County

GWMA/Aquifer: Eastern Shore/ Upper Yorktown-Eastover

Conjunctive Use Source: This system uses no surface water and is therefore not a conjunctive use system.

Withdrawal Use, Current Need, and Projected Demand:

Basis of Need:
Poultry farms use groundwater to provide drinking water to the birds as well as to supply water to either misting systems or evaporative cooling pads designed to regulate temperatures in the house and keep the birds cool. Cooling is primarily required in summer.

Water use for poultry farms varies seasonally as well as in response to the poultry life cycle. Generally during winter, fall, and spring, facility withdrawals rise and fall in a predictable pattern every 50-60 days, or the length of time it takes to raise a flock, with increased usage primarily resulting from increased water consumption as the birds gain weight. This water use pattern starts with low water consumption volumes for chick development and peaks in the last 20-30 days as growers seek to maximize adult weight gains. Typically, farms raise around five flocks per year with this cycle repeating each time. During the summer, withdrawal volumes increase due to additional water usage for flock cooling purposes.

Water volumes used for consumption are controlled by a computer system that provides water to the drinker system, which provides access to water for the birds but limits spillage or excess moisture from entering the house. Avoiding excess moisture is critical to bird health and as a result careful conservation of water is already a key tenet of management in a broiler house. The computer tracks water supplied to the drinking system and records the volume. This data was maintained by some farms but in many cases was not recorded long-term. Where available, data from the computer is discussed in the historic withdrawals section of the factsheet.

The cooling systems are operated based on temperature and humidity and while usage is typically restricted to summers, operation of the cooling systems tends to vary between farms. Historically, water supplied to the cooling systems was not metered so very limited data is available on usage.

Water Demand Projection: Water demands were based on estimated drinking and cooling water amounts needed to supply all the system houses. Proposed withdrawal limits were calculated based on the total of both consumption (drinking water) and cooling. Water use for consumption was calculated based on water use data provided from a poultry farm located in Pocomoke, Maryland. The surrogate farm has houses that are 60 feet by 548 feet and a ratio was used to equate this to Brady Farm. A stocking density of 0.87 square foot per bird is expected for summer and with reductions to 0.85 square foot per bird in winter. An increase of 14% in consumption water use was noted for summer flocks. From day 24-54, or the highest monthly period per flock, water use was estimated to be 2.6 gallons per bird in the summer and 2.3 gallons per bird in winter.

As no data on volumes used for cooling was available from farms operating on the shore, a procedure for estimating water use for cooling was developed for use based on discussions with industry stakeholders, individual farmers, and a review of available literature. House size and cooling fan capacity were identified as the major variables determining water use for cooling

poultry houses. A formula based on 1.6 gallons per year per cubic foot per minute (cfm) of cooling fan capacity was determined to be representative for the Delmarva area poultry industry. The major variable for cooling fan capacity is the width of the house as that provides for the number and size of cooling fans that can be installed. The combined total width of the houses for the facility was used as the basis to estimate cooling water use. The water use calculations are attached to the fact sheet. The permit requires metering of the wells to record total water use and actual amounts used for cooling will be collected.

Water demands are not expected to change as the amount requested represents the maximum capacity of the farm at the full build out of eight houses. No additional houses are considered in this permit. Therefore, no projections are included for this facility.

Withdrawal Volumes Requested: The applicant requested the following withdrawal volumes based upon the projected groundwater demand.

Period of Withdrawal	Actual Volume (gal.)	Volume in MGD
Maximum Monthly:	2,662,332	0.0889
Maximum Annual:	9,801,480	0.0269

DEQ Evaluation

Historic Withdrawals:

No record of historic withdrawals was available for this facility as the facility was recently constructed. Refer to the DEQ Recommended Withdrawal Limits section for more information on how water use was estimated.

Analysis of Alternative Water Supplies: The Eastern Shore of Virginia is an area primarily served by groundwater with the majority of withdrawals coming from the three confined Yorktown-Eastover (Upper/Middle/Lower) aquifers. There is limited surface water availability with the majority of streams being too small to supply sufficient water for most purposes, larger water bodies are typically tidally influenced, and water quality concerns have limited the development of these sources. Withdrawals from the surficial aquifer, or water table, are one viable alternative to withdrawals from the confined system. While withdrawals from the surficial aquifer can present additional water quality challenges in the form of iron forming bacteria and increased vulnerability to surface contaminants, it may be viable in some locations where capacity and quality are sufficient. In general, drinking water for poultry must be of higher quality than the cooling water. In most cases, site-specific data will be necessary to determine the viability of the surficial aquifer and to determine what portions of the use it can supply.

Public Water Supply: The proposed withdrawal does not contain a public water supply component.

Water Supply Plan Review: A Water Supply Planner coordination request was sent on September 10, 2018 and a response was received on January 9, 2019. The response noted several key items.

The Accomack County Regional Water Supply Plan (Plan) includes irrigating agricultural facilities using both groundwater and surface water, with current permitted amounts sufficient to meet demands into 2040. The plan, however, does not include existing poultry farms in their assessments. While the seafood industry could also show future growth in the region, Section 4.0 of the ANPDC Groundwater Management Plan details industrial water for seafood and poultry processing, noting over 90% of industrial groundwater usage is related to poultry processing. WSP Staff note existing water quality concerns for surface waters and no significant water surpluses or sources in Accomack County to serve as alternative sources. Additionally, WSP staff reviewed the current alternatives under consideration, such as water table wells, and noted that the ability of the National Resources Conservation Service's (NRCS) Environmental Quality Incentives Program (EQIP) program to fund such efforts is currently unknown. The current lack of inclusion of poultry in the region's plan, existing water quality and alternative source concerns, and the unknown status of funding for alternative development underlines potential regional resource concerns to be addressed in future planning efforts.

DEQ Recommended Withdrawal Limits: The recommended withdrawal limits are based on the total of both consumption (drinking water) and cooling. Water use for consumption was evaluated based on computer controller data from a comparable farm. The consumption data from a comparable farm was provided and DEQ staff reviewed the data and determined it provided a reasonable basis for estimating monthly and annual consumption for the facility.

DEQ staff evaluated the volumes requested for cooling and determined they were accurately calculated using the procedure discussed in more detail above. Given the lack of data available for evaluating poultry water use, DEQ believes the methods employed are conservative enough to provide sufficient water for the farm to continue operation while still providing a reasonable limit for the permits. It is expected that as more metered data becomes available, withdrawal limits may be reduced in cases where actual water use is significantly lower than the permit limits.

Withdrawal limits were rounded to nearest hundred thousand in accordance with DEQ's April 6, 2015 "Rounding Memo". DEQ recommends the following withdrawal volumes based upon evaluation of the groundwater withdrawal permit application.

Period of Withdrawal	Actual Volume (gal.)	Volume in MGD
Maximum Monthly:	2,700,000	0.09
Maximum Annual:	9,900,000	0.0271

Technical Evaluation:

Aquaveo, LLC performed a technical evaluation of the application for the Department based on the VAHydroGW-ES model. As an aquifer pump test was not performed, the properties from the VAHydroGW-ES model were used to simulate the potential drawdown resulting from the proposed withdrawal. The model uses a base simulation which includes all existing permits (except the applicant wells) operating at their 2017 maximum annual withdrawal limit allowed under the terms of their permit for all Ground Water Management Area (GWMA) permit holders. This base simulation is then executed for 50 years. A second 50-year simulation is then run using the 2D Hantush-Jacob analytical simulation using the aquifer parameters obtained from

VAHydroGW-ES to simulate drawdown resulting from the applicant wells with the proposed withdrawal added. The objectives of this evaluation were to determine the areas of any aquifers that will experience at least one foot of water level decline due to the proposed withdrawal (the Area of Impact or AOI), to determine the potential for the proposed withdrawal to cause salt-water intrusion, and to determine if the proposed withdrawal meets the 80% drawdown criteria. A summary of the results of the evaluation are provided below and the full technical evaluation is attached to this fact sheet as Attachment 2.

Aquaveo, LLC reviewed and compared simulated 2017 water levels from the reported use to USGS measured water levels in observation wells closest to the applicant's withdrawal for the same year for the Upper, Middle, and Lower Yorktown-Eastover aquifers. Comparing the VAHydroGW-ES 2017 Historic Use Water Level with the USGS Network Well 2017 Water Level provides a method for judging the accuracy of the VAHydroGW-ES model. They noted that the water levels obtained from the regional observation network for the Upper Yorktown-Eastover aquifer ranged from nearly the same as simulated water levels to a few ft higher and 7 ft lower. Simulated water levels in the Middle Yorktown-Eastover ranged from 5 ft higher to 14 ft lower compared to USGS wells. Simulated water levels in the Lower Yorktown-Eastover ranged from 3 to 14 ft lower than USGS wells. Aquaveo also noted that the observed water levels in all three aquifers exhibit yearly fluctuations in water levels of approximately 2 to 10 ft. Water levels simulated by the VAHydroGW-ES do not fluctuate in the same manner because the pumping and recharge simulated in the model for any given year are averaged over the year and entered in the model as the average value for the year. Aquaveo concluded that while there are some variations between the observed and simulated water levels, the fluctuations and general patterns observed in the USGS wells are simulated by the VAHydroGW-ES model and the water levels from the two sources are in general agreement. Differences between observed and simulated water levels will be noted and addressed during the next calibration of the VAHydroGW-ES model.

The potential for adverse changes to water quality due to increases salinity resulting from the proposed withdrawal was evaluated using transient, density-dependent, SEAWAT simulations using the VAHydroGW-ES. The results indicated that no model cells simulate an increase in chloride concentration greater than 15 mg/L due to the proposed withdrawal. Therefore, the VAHydroGW-ES model results do not indicate the potential for reduced water quality.

The results of the VAHydroGW-ES simulations predict areas of impact due to the proposed withdrawal in the Upper Yorktown-Eastover aquifer. The Area of Impact (AOI), or the area in which the withdrawal is expected to result in a drawdown of at least 1 foot, extend a maximum distance of approximately 1.0 miles from the production center in the Upper Yorktown-Eastover aquifer. As the AOI extends beyond the property line, a mitigation plan is required and will be incorporated into the permit. The modeled area of impact determines the area in which the facility must evaluate any impacts according to the process laid out in the mitigation plan.

With the inclusion of the proposed withdrawal, the model simulated water levels at -16.2 ft. msl for the Upper Yorktown-Eastover aquifer. The 80% drawdown criterion allows the potentiometric water level (based on the critical surface elevation calculated from the VAHydroGW-ES data) to be reduced to -59.5 ft msl for the Upper Yorktown-Eastover aquifer. Therefore, the water levels in the VAHydroGW-ES cell containing the applicant wells for each confined aquifer are not simulated to fall below the critical surface. Additionally, no new VAHydroGW-ES cells are

simulated to have water levels below the critical surface. Therefore, this withdrawal is within the limits set by the 80% drawdown criterion.

Aquaveo, LLC concluded that the proposed withdrawals meet technical criteria for permit issuance. Maps of the AOIs are included in the attached Mitigation Plan.

Part I
Operating Conditions

Authorized Withdrawals:

Owner Well Name	DEQ Well #	Aquifer	Type	Max Pump Setting (ft. bls)
Well 1	100-01363	Upper Yorktown-Eastover	Production	75
Well 2	100-01364	Upper Yorktown-Eastover	Production	75
Well 3	100-01365	Upper Yorktown-Eastover	Production	75
Well 4	100-01366	Upper Yorktown-Eastover	Production	75
Well 5	100-01367	Upper Yorktown-Eastover	Production	75
Well 6	100-01368	Upper Yorktown-Eastover	Production	90
Well 7	100-01369	Upper Yorktown-Eastover	Production	90
Well 8	100-01370	Upper Yorktown-Eastover	Production	90

*Aquifer top determinations were extrapolated based on land surface elevation compared to the nearest well with an aquifer determination based on geophysical log data collected for Well #1, Well #5, or Well #7.

Apportionment: Apportionment of withdrawals is expected to be fairly equally spread across all facility wells and the permit does not include apportionment limits.

Additional Wells:

Observation Wells: No observation wells are associated with this facility.

Abandoned Wells: No abandoned wells are associated with this facility.

Out of Service Wells: No out-of-service wells are associated with this facility.

Pump Intake Settings:

Pump intakes for the facility wells were set as follows. The pumps for wells #1, #2, #6 and #8 are set at 110 ft below land surface (bls). Wells #3, #4, #5, and #7 are set at 100 ft bls. During construction, the driller appeared to have used well names/numbers that differed from the submitted site plan. This may have resulted in pumps being set below the maximum pump setting as determined by DEQ geologists based on the top of the Upper Yorktown-Eastover. The pump settings as documented above do not appear to align with expected pump settings based on the site layout or the provided recommendations made by DEQ geologists. Additionally, DEQ cited the wrong aquifer top in one case and revised it in a follow up email. Because of these circumstances, the pumps for all eight wells must be verified and raised

if found to be below the maximum pump settings documented in the Authorized Withdrawals table above and in the permit. Based on submitted records, it appears all eight pumps are currently set too low.

The pump settings will need to be verified, and if necessary, raised within four years of permit issuance. The allotted time allows the permittee to plan for the pump resets and incorporate it into any other well maintenance or construction activities that fall within the same timeframe.

Withdrawal Reporting: Groundwater withdrawals are to be recorded monthly and reported quarterly.

Water Conservation and Management Plan:

A Water Conservation and Management Plan (WCMP) meeting the requirements of 9VAC25-610-100.B was submitted and reviewed as part of the application process. The accepted Plan is to be followed by the permittee as an operational Plan for the facility/water system.

- A detailed description of the leak detection and repair program activities and documentation to the Department that these activities have been conducted is due by the end of the first year of the permit term.
- A result of a 12 month audit of the total amount of groundwater used in the distribution system and the amounts for drinking and cooling water, documentation of the flock cycle start and end dates, and any necessary changes to the operation affecting water use is due by the end of the second year of the permit term.
- A report on the plan's effectiveness in maintaining or reducing water use amounts needed, including revisions to those elements of the WCMP that can be improved and addition of other elements found to be effective based on operations to date shall be submitted by the end of years five [*date*] and ten [*date*] of the permit term.

Mitigation Plan: The predicted AOI resulting from the Technical Evaluation extends beyond the property boundaries in the Upper Yorktown-Eastover aquifer. Given this prediction, a Mitigation Plan to address potential claims from existing well owners within the predicted area of impact is included in the permit by reference.

Well Tags: Well tags will be transmitted with the final permit.

Part II
Special Conditions

Pump Intake Determination and Reset: The pump settings will need to be verified, and if necessary, raised within four years of permit issuance (September 30, 2023). The allotted time allows the permittee to plan for the pump resets and incorporate it into any other well maintenance or construction activities that fall within the same timeframe.

Meter Installation/Verification: Meters were installed on each well in 2018 and will cover the total water use from the facility. In cases where meters are found to be incorrectly installed or otherwise failing to capture the total water use of each well, DEQ will notify the permittee of such via an inspection report and the permittee shall correct any meter issues within 60 days.

Part III
General Conditions

General Conditions are applied to all Groundwater Withdrawal Permits, as stated in the Groundwater Withdrawal Regulations, 9VAC25-610-10 *et seq*.

Public Comment

Relevant Regulatory Agency Comments:

Summary of VDH Comments and Actions: This facility is not a public water supply so soliciting comments from VDH was not required.

Public Involvement during Application Process:

Local and Area wide Planning Requirements: The Accomack County Administrator indicated on November 30, 2017 that the facility's operations are consistent with all ordinances.

Public Comment/Meetings:

The public notice was published in xxxxxx on XXX. The public comment period ran from xxxxx to xxxxx

Changes in Permit Part II Due to Public Comments

Changes in Permit Part III Due to Public Comments

Staff Findings and Recommendations

Based on review of the permit application, staff provides the following findings.

- The proposed activity is consistent with the provisions of the Ground Water Management Act of 1992, and will protect other beneficial uses.

- The proposed permit addresses minimization of the amount of groundwater needed to provide the intended beneficial use.
- The effect of the impact will not cause or contribute to significant impairment of state waters.
- This permit includes a plan to mitigate adverse impacts on existing groundwater users.

Staff recommends Groundwater Withdrawal Permit Number GW0072600 be issued as proposed.

Attachments

1. **Technical Evaluation**
2. **Water Conservation Plan**
3. **Mitigation Plan**
4. **Water Use Calculation Worksheet**
5. **Public Comment Sheet**

Approved: _____
Director, Office of Water Supply

Date: _____

Brady Farm Water Conservation Management Plan

Last Updated- 12/15/2017

Permit #:GW0072600

Facility Site Address: 0 New Branch Rd. Green Bush VA 23356

Mailing Address (if different): P.O Box 416
Atlantic Va 23303

Owner: Ryan Brady

Site Contact: Ryan L. Brady Phone: (757) 894 - 4410

General Overview & System Information

- Due to operating in a water conservation area, water pulled from the Yorktown Eastover for Brady Farm will be responsibly used in accordance with the Water conservation management plan, as well as the resource management protection plan. The use of groundwater will be used to provide adequate drinking water and cooling for broiler chickens grown at this location.

- The system will consist of 8-4" deep wells. 5 wells will be centrally located between houses 6 and 7. The wells will have an interval spacing of 75' on center. All lines from this set will run to the generator shed located between houses 6&7. The lines will manifold in this location then disperse to each of the 5 houses. This design has been developed so that all houses can support one another in the event of a well pump going out. The same application will apply to the 3 wells that will be centrally located between houses 2 and 3. These wells also will have an interval spacing of 75' on center. All water pulled will be used for supplying drinking water to the birds, and to produce a cooling effect in hotter months.

- This farm is an eight house farm. Each house will house up to 55,125 broiler chickens. As noted above, once the water enters the manifold it passes through a main water meter. After leaving the manifold it is routed to each houses annex room. Once in the annex room the water passes through a filtration system. After leaving the filter the water manifolds into three lines. One line runs to the drinking system the other to the cooling system. The line that runs to the drinking system enters the water on demand system, through a medication system, then is routed into the house. Once routed to the house it is dispersed to 36 individual drinking lines. The line that runs to the cooling system T's off and runs to the 6" recirculating cool pads, and to the fogger pump. The third line has a spigot in the annex rooms and is routed to both gable ends of the house, this supply is used for cleaning purposes

- Waste Water handling and treatment does not apply. However any run off is collected via swales located between each house. The run off is then routed to a storm water pond.

- There are no future plans for expanding at this point.

Section 1: Water Savings Equipment and Processes

- Drinking water is routed through a water on demand system. This system provides the optimal pressure desired on demand. What this does is it enables higher pressures only when needed, instead of running a constant higher pressure. The benefit of this is less water drips from the drinker line nipple preventing waste. This same system is monitored by the computer. In the event that the set gallons per hour are surpassed, the computer will throw an alarm alerting of a water overflow situation. Water used for cooling is used in two methods, recirculating pads and fogger systems. Both are controlled by the computer which monitors the whole house via digital sensors. The recirculating cool pad system catches the water not used and recirculates it for use. This system only operates during daytime hours and only comes on after all fans are running. The fogger system is a high pressure misting system. The water is on a timer and only comes on after all fans and cool pads have proven to not be enough to cool. This unit is set on a timer and only runs during daylight hours. House checks are performed at least two times per day. Included in these checks are identifying and repairing leaks or potential leaks.

  The only piping that is buried is what goes to the main manifold and to each annex room. Again a main meter will be installed to pick up on any unidentified increase in water consumption.

- All water using equipment above have been designed for the most efficient use of water. Again this is done by staging of non water cooling equipment such as fans. Also by being computer controlled.

Section 2: Water Loss Reduction Program

Water use monitoring will be conducted by the guidelines provided within the recommend scope of the authorities issuing the requested permit. In addition to that, at least twice daily checks will occur in each house. There are a number of ways to be alerted to and investigate a potential leak situation. One of the easiest ways is by checking the water history on the computer. The computers water history screen provides a percentage of increase or decrease of todays water usage based on yesterday. Generally anything over 5% of an increase is grounds to perform a leak investigation. If a leak is suspected the whole house is walked. This is the best type of investigation due to puddles are easy to identify in a poultry house. This is due to the large open floor space. In houses that have birds, birds will move away from the wet spot. This is known as having a bald spot. In the event that a leak is confirmed. Water to that section will be isolated until the repair can take place. In

addition even when a leak is not detected, the normal check of each house is conducted twice daily. During these check certain items are inspected, some of these items include but are not limited to couplings, seals, drinkers, and hoses.

Section 3: Water Use Education Programs

- Currently the only training needed will be a refresher on how to and when to log total farm water usage. In regards to equipment being installed, the equipment installer goes over the start-up and user instructions of the equipment being installed. I am very familiar with all the equipment that I have picked out. Any farm help employed will be involved by isolating and reporting any leak situation to myself. I will be the only one that will be making system adjustments to ensure we are using water in the most conservative manner. Any new water saving equipment is brought up by the integrator, or advertised in the Delmarva poultry industry news letter.

Section 4: Evaluation of Potential Water Reuse Options

- The only feasible way we are able to reuse unused water is through our cool pads. These are a recirculating cool pad. There are no other applicable ways to reuse water.

Section 5: Water Use Reductions during Drought or Water Use Emergencies

- Included in my original submittal, I included the local ground water availability and resource protection plan.
- In addition, in the event of a water shortage. My plan is to only use the amount of water necessary to quench bird thirst and cool the house.

Section 6: Water Use Restrictions during Drought or Water Use Emergencies

- Due to the delicate nature of the birds, it is not feasible to restrict water for cooling or to quench thirst.

Section 7: Penalties for Failure to Comply with Mandatory Water Use Restrictions

- Not a municipal system.

MITIGATION PLAN

DEQ GROUNDWATER WITHDRAWAL PERMIT NO. GW0072600

OWNER NAME: Ryan Brady

FACILITY NAME: Brady Farm

LOCATION: 0 New Branch rd.
Greenbush VA 23356

INTRODUCTION

On 05/03/2017, Ryan Brady submitted a Groundwater Withdrawal Permit Application to the Virginia Department of Environmental Quality (DEQ) to withdraw groundwater. Groundwater withdrawals associated with this permit will be utilized to provide water for drinking and cooling at a commercial poultry farm.

The purpose of this Mitigation Plan is to provide existing groundwater users a method to resolve claims that may arise due to the impact of the withdrawal from Brady Farm well field. Predicted drawdown of water levels due to the withdrawals from the Yorktown East Over aquifer are shown in the attached maps.

Modeled impacts, as shown on the attached maps, extend beyond the boundary of the Brady Farm facility. Due to these findings, Ryan Brady recognizes that there will be a rebuttable presumption that water level declines that cause adverse impacts to existing groundwater users within the area of impact are due to this withdrawal. Claims may be made by groundwater users outside this area; however, there is a rebuttable presumption that Ryan Brady has not caused the adverse impact. Ryan Brady proposes this plan to mitigate impacts to existing users and excludes impacts to wells constructed after the effective date of this permit.

CLAIMANT REQUIREMENTS

To initiate a claim, the claimant must provide written notification of the claim to the following address:

Contact Name	Ryan Brady
Title	Owner
Permittee Name	Ryan Brady
Address	P. O Box 416
City, State Zip Code	Atlantic Va, 23303

The claim must include the following information: (a) a deed or other available evidence that the claimant is the owner of the well and the well was constructed and operated prior to the effective date of the permit; (b) all available information related to well construction, water levels, historic yield, water quality, and the exact location of the well sufficient to allow Ryan Brady to locate the well on the claimant's property; (c) the reasons the claimant believes that the Brady Farm withdrawal has caused an adverse impact on the claimants well(s).

CLAIM RESOLUTION

Ryan Brady will review any claim within **five (5) business days**. If Ryan Brady determines that no rebuttal will be made and accepts the claim as valid, Ryan Brady will so notify the claimant and will implement mitigation within **thirty (30) business days**. If the claim is not accepted as valid, Ryan Brady will notify the claimant that (a) the claim is denied **or** (b) that additional documentation from the claimant is required in order to evaluate the claim. Within **fifteen (15) business days** of receiving additional documentation from the claimant, Ryan Brady will notify the claimant (a) that Ryan Brady agrees to mitigate adverse impacts or (b) the claim is denied. If the claim is denied, the claimant will be notified that the claimant may request the claim be evaluated by a three (3) member committee. This committee will consist of one (1) representative selected by Ryan Brady, one (1) representative selected by the claimant, and one (1) representative mutually agreed upon by the claimant and Ryan Brady

Any claimant requesting that a claim be evaluated by the committee should provide the name and address of their representative to Ryan Brady. Within **five (5) business days** of receipt of such notification, Ryan Brady will notify the claimant and claimant's representative of the identity of Ryan Brady's representative and instruct the representatives to select a third representative within **ten (10) business days**. Representatives should be a professional engineer or hydrogeologist with experience in the field of groundwater hydrology. Ryan Brady agrees to reimburse the members of the committee for reasonable time spent, at a rate prevailing in the area for experts in the above listed fields, and for direct costs incurred in administering the plan. The claimant may, at his or her option, choose to provide the reimbursement for the member of the committee selected by the claimant and up to half of the reimbursement for the mutual representative.

Within **ten (10) business days** of selection of the third representative, the committee will establish a **reasonable deadline** for submission of all documentation it needs to evaluate the claim. Both the claimant and Ryan Brady will abide by this deadline.

Within **fifteen (15) business days** of receipt of documentation, the committee will evaluate the claim and reach a decision by majority vote. The committee will notify the claimant regarding its decision to (a) deny or (b) approve the claim. If the claim is approved, Ryan Brady will mitigate the adverse impacts within **thirty (30) business days** of making the decision or as soon as practical. If the claim is denied by the committee, Ryan Brady may seek reimbursement from the claimant for the claimant's committee representative and one half of the 3rd

representative on the committee.

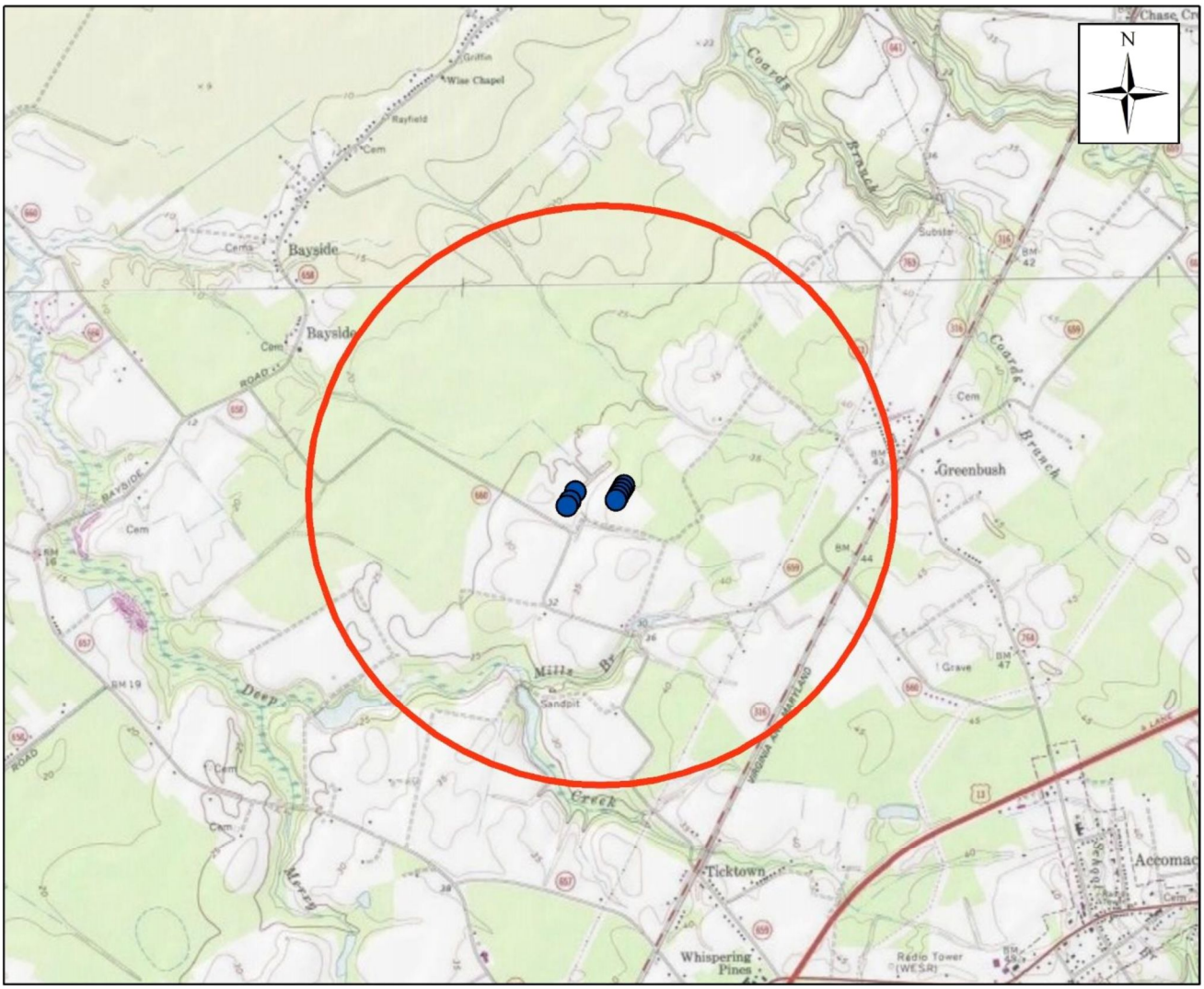
If a claimant within the indicated area of impact indicates that they are out of water, Ryan Brady will accept the responsibility of providing water for human consumptive needs within **seventy-two (72) hours** and to cover the claim review period. Ryan Brady reserves the right to recover the cost of such emergency supply if the claim is denied by Ryan Brady or found to be fraudulent or frivolous. If Ryan Brady denies a claim and the claimant elects to proceed with the three (3) member committee, Ryan Brady will continue the emergency water supply at the claimants request during the committee's deliberations, but reserves the right to recover the total costs of emergency water supply in the case that the committee upholds the denial of the claim. Similarly, Ryan Brady reserves the right to recover costs associated with the claim process if a claim is found to be fraudulent or frivolous.

- If it is determined by the committee or shown to the committee's satisfaction that a well operating under a mitigation plan similar to Ryan Brady /Brady Farm's Plan other than those owned and operated by Ryan Brady has contributed to the claimed adverse impact, Ryan Brady's share of the costs associated with mitigation will be allocated in proportion to its share of the impact. Such a determination shall be made by the committee after notification of the third party well owner, giving the third party well owner opportunity to participate in the proceedings of the committee.

PLAN ADMINISTRATION

Nothing in the Plan shall be construed to prevent the Department of Environmental Quality Staff from providing information needed for resolution of claims by the committee.

Brady Poultry Farm
Area of Impact - Upper Yorktown-Eastover Aquifer



Brady Poultry Wells

Upper Yorktown-Eastover Aquifer Area of Impact

0 0.25 0.5 1 Miles

Simulated drawdown at or exceeding one foot in the Upper Yorktown-Eastover aquifer resulting from a 2-dmensional Hantush-Jacob (1955) analytical simulation of 9,900,000 gallons per year (27,123 average gpd) for 50 years from the Upper Yorktown-Eastover aquifer.

Maximum radius of one foot drawdown (Area of Impact) extends approximately 1.0 miles from the pumping center.

Technical evaluation performed by Aquaveo, LLC for the Virginia DEQ, Office of Water Supply
December 14, 2018

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Brady Farm
Accomack County, VA
Groundwater Withdrawal Permit Application

Facility Information

The below calculations were based on a facility with 8 poultry houses (8 houses @ 66 ft width).

Consumption

Below please find water calculations for drinking water consumption. The numbers are from a Mountaire Farm located in Pocomoke Maryland. The birds were held for 54 days. This would be the longest I would ever hold a flock. The size of the houses are 60' x 548'. The density the birds were placed on was .87. Below you will see that my summer density is a .85 for winter flocks, and a .87 for summer flocks. The timing of the year for the data used was November / December time frame . We base off of a 5 flock yearly average, with 3 of the flocks considered winter flocks, and 2 considered summer flocks.

Note, we can see an uptick in water consumption during summer flocks as much as 14%. Please keep in mind that this metric is per bird not per square foot like cooling metrics.

Day 24 - 54 (last 30 day consumption) per bird drinking water consumption is 2.3 gallons per bird

Winter flock 8 - 67' x 660' broiler houses for Ryan Brady on a .85 density

= 416,188 birds X 2.3 gallons per bird = 957,232 gallons of water for drinking consumption

Summer flock 8 - 67' x 660' broiler houses for Ryan Brady on a .87 density

= 406,620 birds X 2.3 gallons per bird + 14% summer increase = 2.6 gallons per bird = 1,057,212 gallons of water for drinking consumption .

Max Annual for Consumption = 3 Winter Flocks (each 957,232 gallons) + 2 Summer Flocks (each 1,057,212 gallons) = **4,986,120 gallons**

Max Monthly for Consumption = 1,057,212 gallons (based on water use for a summer flock)

Cooling

See attached Figure 12 of University of Georgia, Poultry Housing Tips (Evaporative Cooling Pad System Water Usage), Volume 29, Number 1, 2017, for evaporative cooling pad water usage per tunnel fan capacity. Water use for cooling is based on the tunnel fan capacity in the poultry house. See attached Page 6 of Cobb-Vantress, Broiler Management Guide, November 15, 2013, to determine the tunnel fan capacity (operating at an airspeed of 600 fpm) based on house width. It is estimated that 1.6 gallons a year (gal/yr) is used per 1 cubic feet per minute (cfm) of tunnel fan capacity. To calculate a water usage estimate for total annual cooling per house, multiply the tunnel fan capacity by 1.6.

$$Annual\ Cooling\ (based\ on\ data\ from\ Easton, MD) \approx \frac{160{,}000\ \frac{gal}{yr}}{100{,}000\ cfm} \approx \frac{1.6\ \frac{gal}{yr}}{1\ cfm}$$

Finally, if all houses are equally sized, multiply that number by the number of houses to determine your maximum annual water use for cooling. If houses vary in size, the tunnel fan capacity must be determined for each size and then multiplied by the total number of houses of that size.

$$Tunnel\ Fan\ Capacity = \left[376{,}200\ \frac{cfm}{hse} \times 8\ hse\right] = 3{,}009{,}600\ \ cfm$$

$$Annual\ Cooling = 3{,}009{,}600\ cfm\ \times \frac{1.6\ \frac{gal}{yr}}{1\ cfm} = 4{,}815{,}360\ \frac{gal}{yr}$$

To determine the maximum monthly amount for cooling, divide the maximum annual amount for cooling by 3 to provide flexibility.

Requested Withdrawal Amounts

The following are example requests for a maximum annual and monthly withdrawal including the consumption and cooling values as calculated above.

$$Annual\ Amount = 4{,}986{,}120\ \frac{gal}{yr}\ (consumption) + 4{,}815{,}360\ \frac{gal}{yr}\ (cooling) = X\ \frac{gal}{yr}$$
$$\approx 9{,}801{,}480\ \frac{gal}{yr}$$

$$Monthly\ Amount = 1{,}057{,}212\ \frac{gal}{mo}\ (consumption) + \left[\frac{4{,}815{,}360\ \frac{gal}{yr}}{3}\right]\ (cooling) = 2{,}662{,}332\ \frac{gal}{mo}$$

COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

TECHNICAL EVALUATION FOR PROPOSED GROUNDWATER WITHDRAWAL

Date: December 14, 2018

Application /Permit Number: GW0072600

Owner / Applicant Name: Ryan Brady

Facility / System Name: Brady Poultry Farm

Facility Type: Agriculture – Poultry Farm

Facility / System Location: Accomack County

The Commonwealth of Virginia's Groundwater Withdrawal Regulations (9VAC25-610-110(D) state that, for a permit to be issued for a new withdrawal, to expand an existing withdrawal, or reapply for a current withdrawal, a technical evaluation shall be conducted. This report documents the results of the technical evaluation conducted to meet the requirements for the issuance of a permit to withdrawal groundwater within a Groundwater Management Area as defined in (9VAC25-600-10 et seq.).

This evaluation determines the:

(1) The Area of Impact (AOI): The AOI for an aquifer is the areal extent of each aquifer where one foot or more of drawdown is predicted to occur as a result of the proposed withdrawal.
(2) Water Quality: The potential for the proposed withdrawal to cause salt water intrusion into any portions of any aquifers or the movement of waters of lower quality to areas where such movement would result in adverse impacts on existing groundwater users or the groundwater resource as per (9VAC25-610-110(D)(2), and
(3) The Eighty Percent Drawdown (80% Drawdown): The proposed withdrawal in combination with all existing lawful withdrawals will not lower water levels, in any confined aquifer that the withdrawal impacts, below a point that represents 80% of the distance between the land surface and the top of the aquifer at the points where the one-foot drawdown contour is predicted for the proposed withdrawal as per 9VAC25-610-110(D)(3)(h).

Summary of Requested Withdrawal:

General:

In response to the Department of Environmental Quality's (DEQ) Compliance Assistance Framework initiative, a cohort of poultry farms in Accomack County were identified as potentially requiring a groundwater withdrawal permit (GWWP). The farms primarily grow broilers which are processed by several poultry integrators located in the area. These farms use groundwater to provide drinking water to the birds as well as to supply water to either misting systems or evaporative cooling pads which cool the birds. Cooling is primarily required in summer. Most wells associated with poultry farms in Accomack County are screened in either the upper, middle, or lower Yorktown-Eastover aquifers. The use of the Columbia (water-table) aquifer is being investigated by the industry and this aquifer may be used in the future to augment withdrawals from confined aquifers where possible.

Water use for poultry farms varies seasonally as well as in response to the poultry life cycle. Generally during winter, fall, and spring, facility withdrawals rise and fall in a fairly predictable pattern every 50-60 days, with usage primarily resulting from water consumption. This pattern starts with low water

consumption volumes for chick development and maxes out in the last 20-30 days as breeders seek to maximize adult weight gains. Typically, farms raise around five flocks per year with this cycle repeating each time. During the summer, withdrawal volumes increase due to additional water usage for flock cooling purposes. A few farms have additional sanitary and other agricultural uses (crops/other livestock).

Facility Specific:
Brady Poultry Farm has 8 poultry houses and 8 production wells. The houses are all 67 x 660 feet in size. Proposed withdrawal limits were calculated based on the total of both consumption (drinking water) and cooling. Water use for consumption was calculated based on meter data for a comparable farm. Water use for cooling was calculated based on estimates based on house size and cooling fan capacity.

The proposed withdrawal limits and well construction details are as follows:

Proposed Withdrawal Limits:

Proposed Withdrawal Limits	
Annual Value	9,900,000 (27,123 average gpd)
Monthly Value	2,700,000 (87,097 average gpd)

Proposed Apportionment of Withdrawal:
Due to the well and plumbing configuration, the withdrawal will be apportioned fairly equally between the system wells and no apportionment is required.

Production Well(s):

Identification	Location	Construction	Pump Intake	Source Aquifer
Owner Well Name: Well #1 DEQ Well Number: 100-01363 MPID: 374425075415401	Lat: 37° 44' 25.6812" Lon: -75° 41' 54.4037" Datum: WGS84 Elevation: 34	Completion Date: 11-07-2017 Screens (ft-bls): 135-150 Total Depth (ft-bls): 150	110	Upper Yorktown-Eastover
Owner Well Name: Well #2 DEQ Well Number: 100-01364 MPID: 374425075415402	Lat: 37° 44' 25.1239" Lon: -75° 41' 54.8452" Datum: WGS84 Elevation: 34	Completion Date: 3-02-2018 Screens (ft-bls): 135-150 Total Depth (ft-bls): 150	110	Upper Yorktown-Eastover

Owner Well Name: Well #3 DEQ Well Number: 100-01365 MPID: 374424075415503	Lat: 37° 44' 24.5273" Lon: -75° 41' 55.3228" Datum: WGS84 Elevation: 35	Completion Date: 05-11-2018 Screens (ft-bls): 135-150 Total Depth (ft-bls): 150	100	Upper Yorktown-Eastover
Owner Well Name: Well #4 DEQ Well Number: 100-01366 MPID: 374423075415504	Lat: 37° 44'23.9480" Lon: -75° 41' 55.7651" Datum: WGS84 Elevation: 35	Completion Date:5-25-2018 Screens (ft-bls): 135-150 Total Depth (ft-bls): 150	100	Upper Yorktown-Eastover
Owner Well Name: Well #5 DEQ Well Number: 100-01367 MPID: 374423075415605	Lat:37° 44' 23.32" Lon: -75° 41' 56.1813" Datum: WGS84 Elevation: 36	Completion Date: 05-31-18 Screens (ft-bls): 135-150 Total Depth (ft-bls): 150	100	Upper Yorktown-Eastover
Owner Well Name: Well #6 DEQ Well Number: 100-01368 MPID: 37442475420406	Lat: 37° 44' 24.8677" Lon: -75° 42' 4.9363" Datum: WGS84 Elevation: 25	Completion Date: 8-15-18 Screens (ft-bls): 145-160 Total Depth (ft-bls): 160	110	Upper Yorktown-Eastover
Owner Well Name: Well #7 DEQ Well Number: 100-01369 MPID: 374423075420607	Lat: 37° 44' 23.20422" Lon: -75° 42' 06.18660" Datum: WGS84 Elevation: 26	Completion Date: 7-25-18 Screens (ft-bls): 150-160 Total Depth (ft-bls): 160	100	Upper Yorktown-Eastover
Owner Well Name: Well #8 DEQ Well Number: 100-01370 MPID: 374422075420608	Lat: 37° 44' 22.3078" Lon: -75° 42' 6.8413" Datum: WGS84 Elevation: 27	Completion Date: 8-31-18 Screens (ft-bls): 145-160 Total Depth (ft-bls): 160	110	Upper Yorktown-Eastover

Geologic Setting:
The Brady Poultry Farm wells (applicant wells) are located in central Accomack County. The production wells are screened in the Upper Yorktown-Eastover aquifer. The upper portion of the Yorktown-Eastover aquifer (described in the 2006 Virginia Coastal Plain Hydrologic Framework[1] (VCPHF) as a combination of the Upper, Middle, and Lower Yorktown-Eastover aquifers) is composed primarily of estuarine to marine quartz sands of the Yorktown Formation of Pliocene age. The nearest USGS geologic cross section found in USGS Professional Paper 1731 is cross-section GS-GS' (see attached figure at the end of the report).

Virginia Eastern Shore Model data:
The following table lists the location of the applicant production wells within the Virginia Eastern Shore Model[2] (VAHydroGW-ES).

VAHydroGW-ES Model Grid				
Well	**Well Number**	**MPID**	**Row**	**Column**
Well #1	100-01363	374425075415401	127	40
Well #2	100-01364	374425075415402	127	40
Well #3	100-01365	374424075415503	127	40
Well #4	100-01366	374423075415504	127	40
Well #5	100-01367	374423075415605	127	40
Well #6	100-01368	374424075420406	127	39
Well #7	100-01369	374423075420607	127	39
Well #8	100-01370	374422075420608	127	39

Hydrologic Framework:
Data from the VCPHF is reported in this technical report to illustrate the hydrogeologic characteristics of the aquifers in the Virginia Eastern Shore near the applicant wells and identify major discrepancies between regional hydrogeology and site logs interpreted by the DEQ staff geologist.

The following average aquifer elevations were estimated from the VAHydroGW-ES at the model cell(s) containing the applicant production wells.

VAHydroGW-ES Average Hydrologic Unit Information		
Aquifer	**Elevation (feet msl)**	**Depth (feet bls)**
Surface	29	0
Columbia aquifer (bottom)	-19	48
Upper Yorktown-Eastover aquifer (top)	-79	108
Upper Yorktown-Eastover aquifer (bottom)	-123	152
Middle Yorktown-Eastover aquifer (top)	-145	173
Middle Yorktown-Eastover aquifer (bottom)	-176	204
Lower Yorktown-Eastover aquifer (top)	-202	231
Lower Yorktown-Eastover aquifer (bottom)	-283	312

[1] McFarland, E.R., and Bruce, T.S., 2006, The Virginia Coastal Plain Hydrogeologic Framework: U.S. Geological Survey Professional Paper 1731, 118 p., 25 pls.
[2] Sanford, W.E., Pope, J.P., and Nelms, D.L., 2009, Simulation of groundwater-level and salinity changes in the Eastern Shore, Virginia: U.S. Geological Survey Scientific Investigations Report 2009–5066, 125 p.

Groundwater Characterization Program Recommendations:
DEQ staff geologist has reviewed available information and made the following determinations regarding the location of the aquifer tops for the following wells. Information reviewed in this process included driller's logs, geophysical logs from the Well #1, #5, and #7 locations, GW-2 forms and The Virginia Coastal Plain Hydrogeologic Framework (USGS Professional Paper 1731) etc.

Unit	Well #1 (ft-bls)	#2*	#3*	#4*	#5	#6*	#7	#8*
Bottom of the Columbia	55	55	56	54	55	49	50	51
Top of the Upper Yorktown-Eastover	75	75	76	74	75	89	90	91
Bottom of the Upper Yorktown-Eastover	155	155	156	149	150	149	160	161

*Aquifer top determinations were extrapolated based on land surface elevation compared to the nearest well with an aquifer determination based on geophysical log data; Well #1, Well #5, or Well #7.

Comparison of the Hydrogeologic Framework and Groundwater Characterization Program Recommendations:
The average Upper Yorktown-Eastover aquifer top and bottom elevations of -49 ft-msl/81 ft-bls and -122 ft-msl/154 ft-bls provided by the DEQ staff geologist are higher than and equal to, respectively, the elevations reported in the VAHydroGW-ES framework (-79 ft-msl/108 ft-bls and -123 ft-msl/152 ft-bls). Thus, the unit thickness in the VAHydroGW-ES for the Upper Yorktown-Eastover aquifer is thinner than the unit thickness supplied by DEQ staff. Local variation not captured on the regional scale of the VAHydroGW-ES are expected to occur. The VAHydroGW-ES is updated on a regular basis to reflect the most up-to-date surface elevations that are available.

Water Level Comparison:
Below water levels retrieved from the USGS regional observation network wells are compared to the simulated water levels reported in the *Virginia Eastern Shore 2017-2018 Annual Simulation of Potentiometric Groundwater Surface Elevations of Reported and Total Permitted Use* report (the 2017-2018 report) and simulation files.[3] This comparison is made in order to evaluate the performance of the regional model in the vicinity of the applicant wells and assess historical groundwater trends.

The 2017-2018 report provides two sets of simulated potentiometric water surface elevations. The VAHydroGW-ES model is divided into three parts. The first portion of the model simulates water levels within the Eastern Shore aquifers from 1900 through 2017 based upon historically reported pumping amounts (the "*Historic Use Simulation*"). This portion of the model has been calibrated to match water levels observed in USGS regional observation network wells situated throughout the peninsula. The water levels reported in the 2017-2018 report are based upon two separate simulations, each simulation running from 2018 through 2067. The simulated pumping amount in these two simulations are based upon, 1) the average 2013-2017 reported withdrawal amount of wells in the VAHydroGW-ES model (the "R*eported Use Simulation*") and, 2) the current (2018) maximum withdrawal amount allowed under their current permit for wells in the VAHydroGW-ES model (the "*Total Permitted Simulation*"). Both these simulations are an extension of the *Historic Use Simulation* and the water levels reported in the 2017-2018 report are the final water levels simulated at the end of the simulations (2067).

[3] See *Virginia Eastern Shore 2017-2018 Annual Simulation of Potentiometric Groundwater Surface Elevations of Reported and Total Permitted Use* report and simulation files on file with the VA DEQ.

The "VAHydroGW-ES 2067 Reported Use Water Level," reported in the tables below, is the simulated water level – 50 years from present – if all permitted pumping continued at the average 2013-2017 reported withdrawal amount for the next 50 years. And the "VAHydroGW-ES 2067 Total Permitted Water Level," reported in the tables below, is the simulated water level – 50 years from present – if all Eastern Shore permitted wells were to pump at the maximum permitted amount allowed under their current permit for the next 50 years. Finally, the "VAHydroGW-ES 2017 Historic Use Water Level," reported in the tables below, is the water level simulated for the year 2017 in the *Historic Use Simulation*.

The nearest USGS regional observation network wells to the applicant wells, completed in the Upper, Middle, or Lower Yorktown-Eastover aquifers, are listed in the following tables and shown in Figure 1. For the USGS regional observation network wells, average 2017 reported water levels are shown in the following tables. Simulated water levels for the Upper, Middle, and Lower Yorktown-Eastover aquifers, for the VAHydroGW-ES cells containing the USGS regional observation network wells are also shown in the following tables.

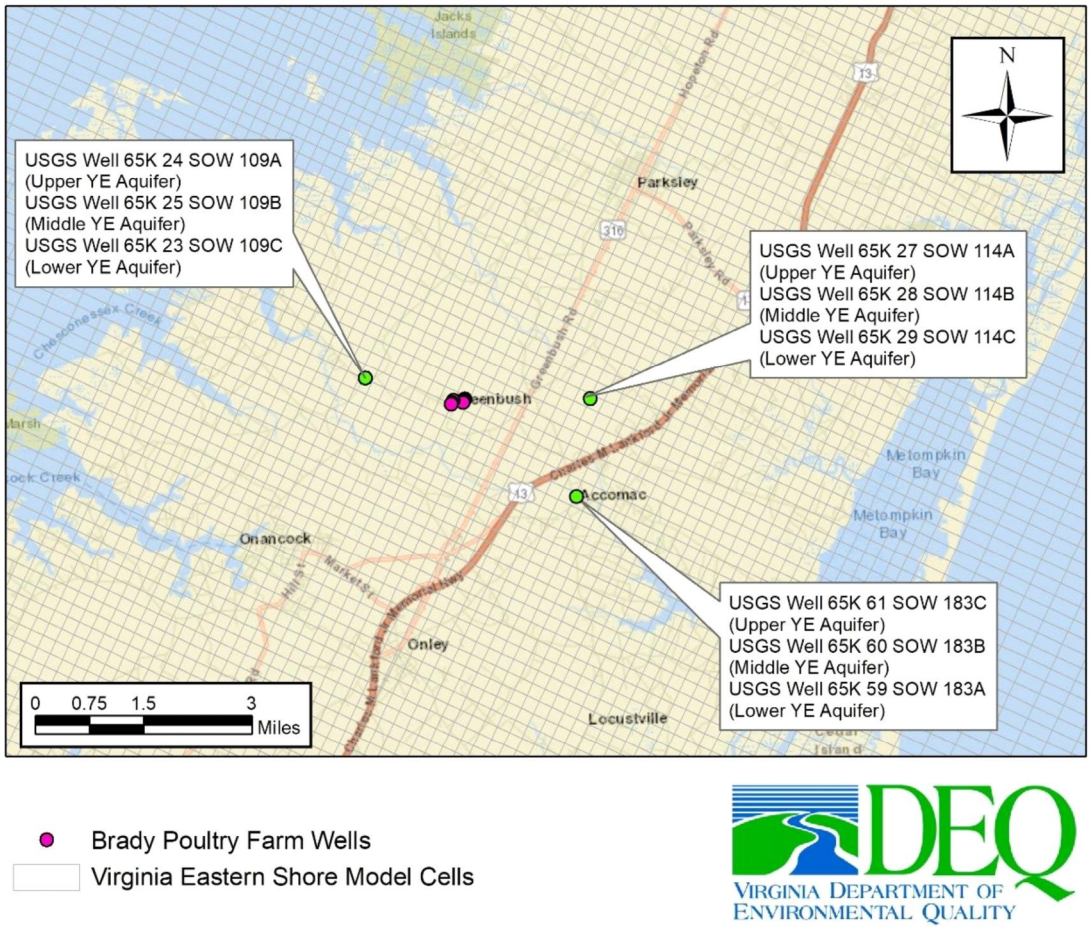


Figure 1. Nearest USGS regional observation network wells.

Comparing the VAHydroGW-ES 2017 Historic Use Water Level with the USGS Network Well 2017 Water Level provides a method for judging the accuracy of the VAHydroGW-ES. Figures 2 through 10 show graphs of the recorded water levels from the USGS observation wells listed in the following tables. These figures also show the simulated VAHydroGW-ES *Historic Use Simulation* water levels for the model cell containing each USGS well. Observing the simulated and observed water elevations together provide a second method for assessing the accuracy of the VAHydroGW-ES in the vicinity of the applicant wells.

The Upper Yorktown-Eastover VAHydroGW-ES 2017 Reported Use Water Level is essentially the same value as the USGS Network Well 2017 Water Level observed in Well 65K 24 SOW 109A. The 2017 VAHydroGW-ES water level is a few feet higher than the level observed in Well 65K 27 SOW 114A and seven feet lower than the level observed in 65K 61 SOW 183C. The water levels observed over the past approximately 40 years in each Upper Yorktown-Eastover USGS well are shown in Figures 2 through 4. The wells exhibit yearly fluctuations in water levels of approximately 2 to 5 feet. Water levels simulated by the VAHydroGW-ES do not fluctuate in the same manner because the pumping and recharge simulated in the model for any given year are averaged over the year and entered in the model as the average value for the year. Water levels for the USGS Upper Yorktown-Eastover wells are in general agreement with the water levels simulated by the VAHydroGW-ES – especially for Well 65K 24 SOW 109A. While still reasonably accurate, water levels are approximately 5 feet lower for Well 65K 27 SOW 114A and approximately 5 feet higher for Well 65K 61 SOW 183C, over the past decade, when compared to those simulated by the VAHydroGW-ES.

The Middle Yorktown-Eastover VAHydroGW-ES 2017 Reported Use Water Levels are five feet higher to 14 feet lower than the USGS Network Well 2017 Water Levels observed in Well 65K 25 SOW 109B, Well 65K 28 SOW 114B, and Well 65K 60 SOW 183B. The water levels observed over the past 30 to 40 years in the Middle Yorktown-Eastover USGS wells are shown in Figures 5 through 7. Each well exhibits yearly fluctuations in water levels of approximately 2 to 10 feet. Water levels for the USGS Middle Yorktown-Eastover wells are in general agreement with the water levels simulated by the VAHydroGW-ES. Water levels for Well 65K 25 SOW 109B are higher by approximately 5 feet than those simulated by the VAHydroGW-ES over the past 40 years. The fluctuations and general patterns observed in Well 65K 28 SOW 114B and Well 65K 60 SOW 183B are generally simulated by the VAHydroGW-ES. The large spike in the simulated water level at the end of 2012 (observed in Well 65K 28 SOW 114B and Well 65K 60 SOW 183B) is due to a significant reduction in reported pumping for the year 2012 by a large, nearby withdrawal. The absence of a corresponding jump in water levels in the USGS observation wells indicates that the reported pumping amounts for the year 2012 may not have matched the actual pumping in the vicinity of the well.

The Lower Yorktown-Eastover VAHydroGW-ES 2017 Reported Use Water Level is approximately 3 feet lower than the USGS Network Well 2017 Water Level observed in Well 65K 59 SOW 183A; the VAHydroGW-ES 2017 value for USGS Well 65K 23 SOW 109C is approximately 2 feet higher; and the 2017 VAHydroGW-ES water level is approximately 14 feet lower than the level observed in Well 65K 98 SOW 114C. The water levels observed over the past 30 to 40 years in the Lower Yorktown-Eastover USGS wells are shown in Figures 8 through 10. Each well exhibits yearly fluctuations in water levels of approximately 2 to 10 feet. Water levels for the USGS Lower Yorktown-Eastover wells are in general agreement with the water level simulated by the VAHydroGW-ES – with the same general discrepancies noted in the Middle Yorktown-Eastover observations.

Differences between observed and simulated water levels will be noted and addressed during the next calibration of the VAHydroGW-ES.

Upper Yorktown-Eastover Measurements	65K 24 SOW 109A	65K 27 SOW 114A	65K 61 SOW 183C
Distance from applicant wells (miles)	1.3	1.8	2.0
VAHydroGW-ES Row	128	123	130
VAHydroGW-ES Column	33	49	51
VAHydroGW-ES Land Surface Elevation (ft-msl)	13	45	39
USGS Well Land Surface Elevation (ft-msl)	12	45	35
USGS Network Well 2017 Water Level (ft-msl)	5.8	-0.3	15.4
VAHydroGW-ES 2017 Reported Use Water Level (ft-msl)	5.7	2.7	8.3
VAHydroGW-ES 2067 Reported Use Water Level (ft-msl)	5.6	2.5	8
VAHydroGW-ES 2067 Total Permitted Water Level (ft-msl)	4.3	-1.4	4.8

Middle Yorktown-Eastover Measurements	65K 25 SOW 109B	65K 28 SOW 114B	65K 60 SOW 183B
Distance from applicant wells (miles)	1.3	1.8	2.0
VAHydroGW-ES Row	128	123	130
VAHydroGW-ES Column	33	49	51
VAHydroGW-ES Land Surface Elevation (ft-msl)	13	45	39
Land Surface Elevation (ft-msl)	12	45	35
USGS Network Well 2017 Water Level (ft-msl)	0.2	-29	10.4
VAHydroGW-ES 2017 Reported Use Water Level (ft-msl)	5.3	-43.6	2.9
VAHydroGW-ES 2067 Reported Use Water Level (ft-msl)	5.2	-41.8	2.1
VAHydroGW-ES 2067 Total Permitted Water Level (ft-msl)	3.9	-49.4	-1.7

Lower Yorktown-Eastover Measurements	65K 23 SOW 109C	65K 29 SOW 114C	65K 59 SOW 183A
Distance from applicant wells (miles)	1.3	1.8	2.0
VAHydroGW-ES Row	128	123	130
VAHydroGW-ES Column	33	49	51
VAHydroGW-ES Land Surface Elevation (ft-msl)	13	45	39
Land Surface Elevation (ft-msl)	13	45	35
USGS Network Well 2017 Water Level (ft-msl)	-0.3	-49.2	-17
VAHydroGW-ES 2017 Reported Use Water Level (ft-msl)	1.8	-63.6	-20.4
VAHydroGW-ES 2067 Reported Use Water Level (ft-msl)	1.5	-61.5	-20.7
VAHydroGW-ES 2067 Total Permitted Water Level (ft-msl)	0.1	-62.8	-20.1

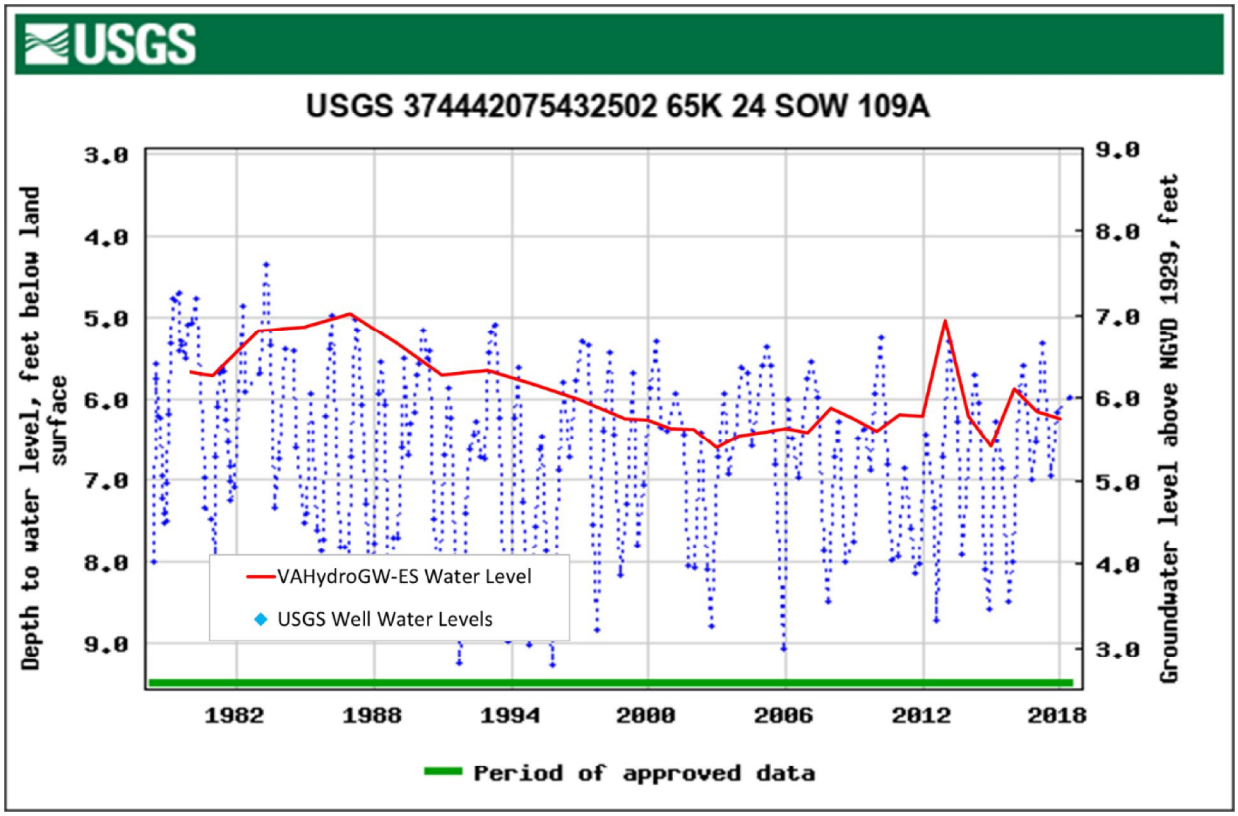


Figure 2. USGS Regional Observation Well 65K 24 SOW 109A, Upper Yorktown-Eastover aquifer water levels recorded from 1978 to present (well depth 130 ft bls, land surface 12 ft msl).

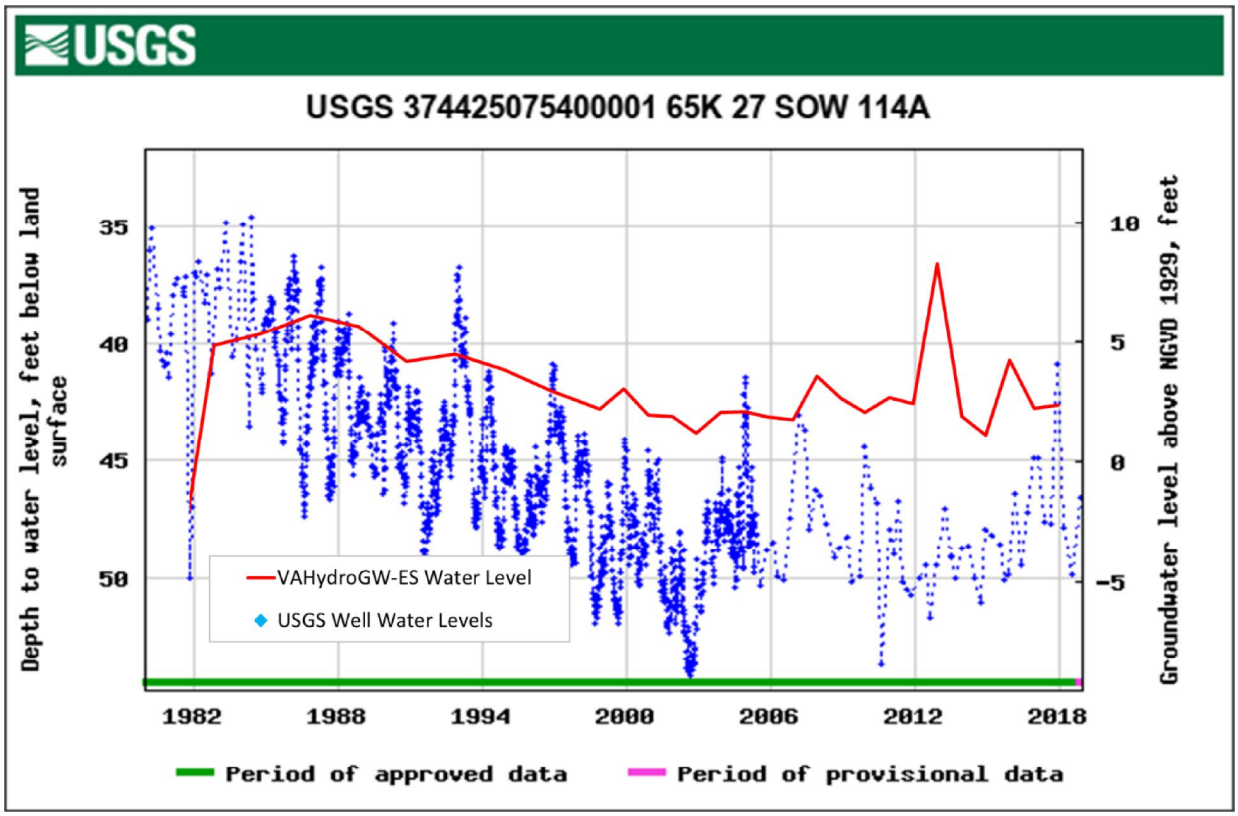


Figure 3. USGS Regional Observation Well 65K 27 SOW 114A, Upper Yorktown-Eastover aquifer water levels recorded from 1980 to present (well depth 160 ft bls, land surface 45 ft msl).

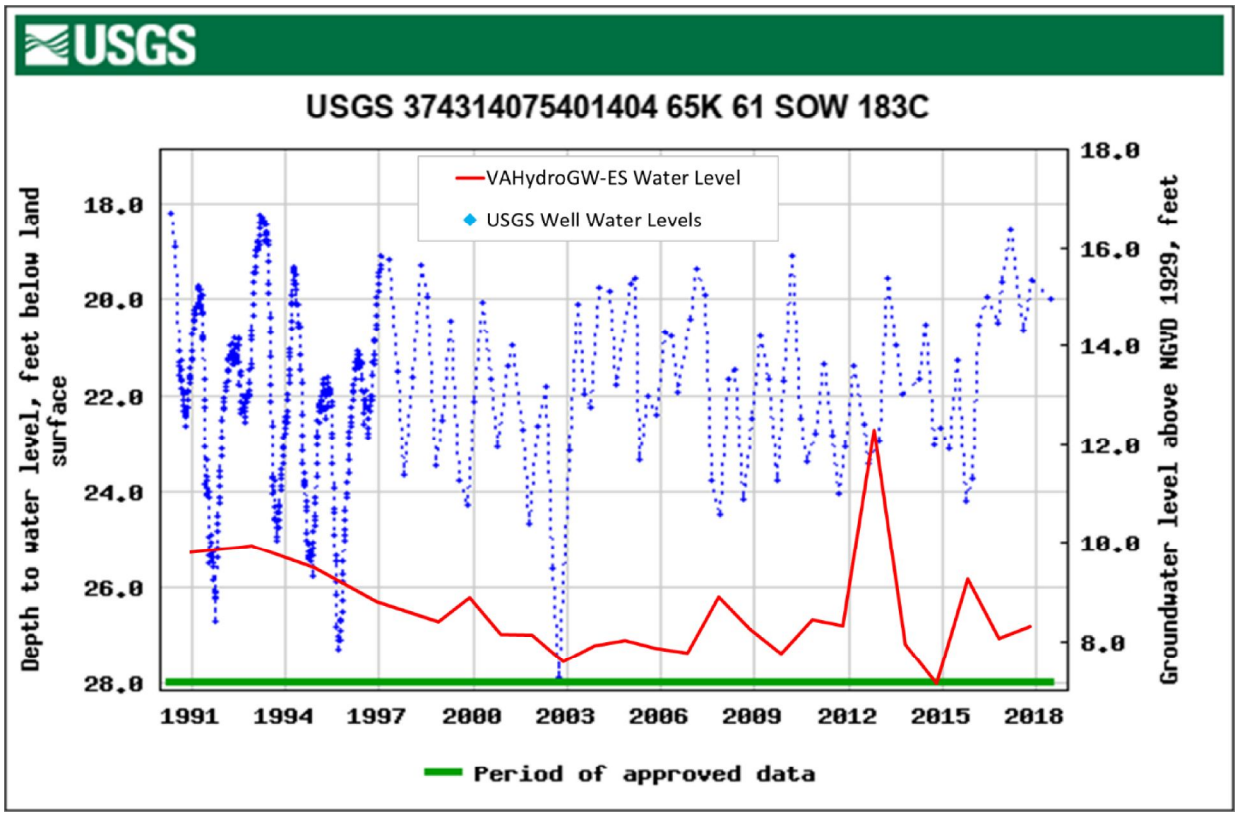


Figure 4. USGS Regional Observation Well 65K 61 SOW 183C, Upper Yorktown-Eastover aquifer water levels recorded from 1990 to present (well depth 135 ft bls, land surface 35 ft msl).

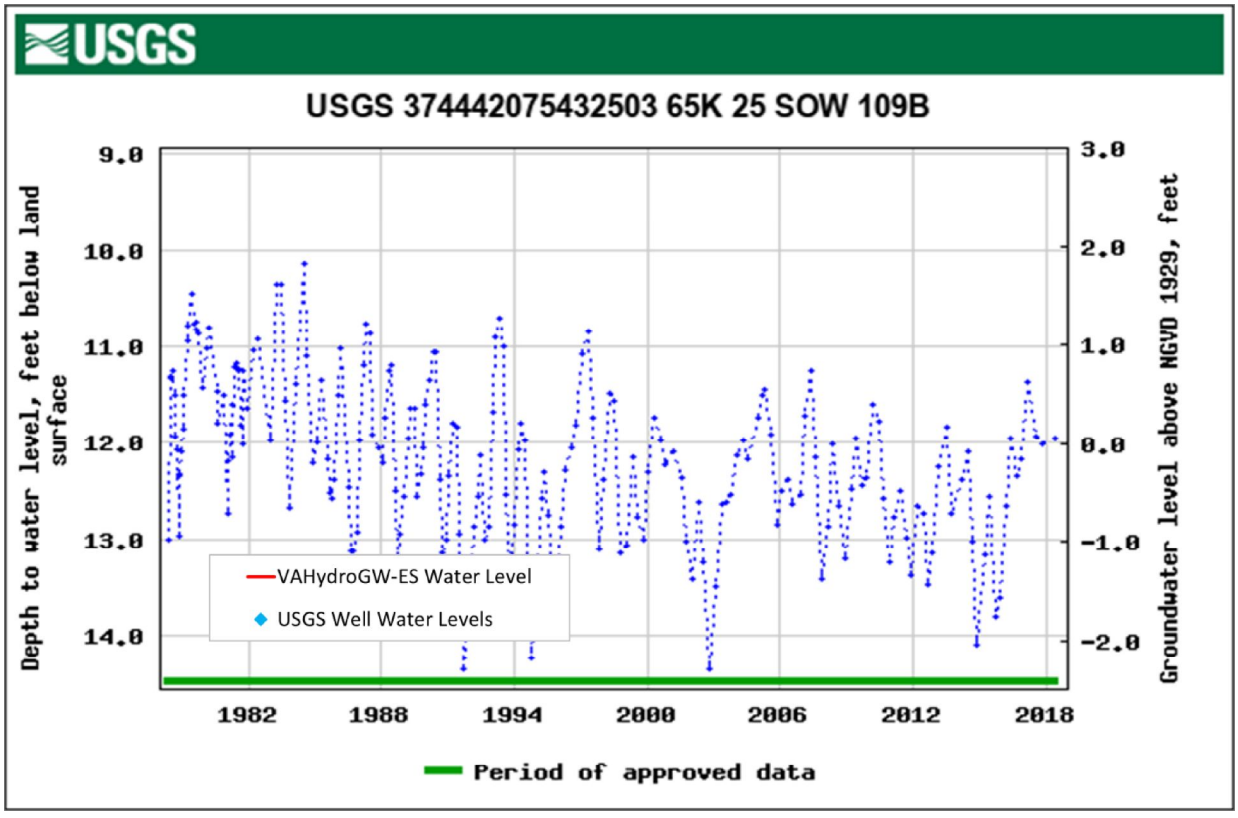


Figure 5. USGS Regional Observation Well 65K 25 SOW 109B, Middle Yorktown-Eastover aquifer water levels recorded from 1978 to present (well depth 228 ft bls, land surface 12 ft msl).

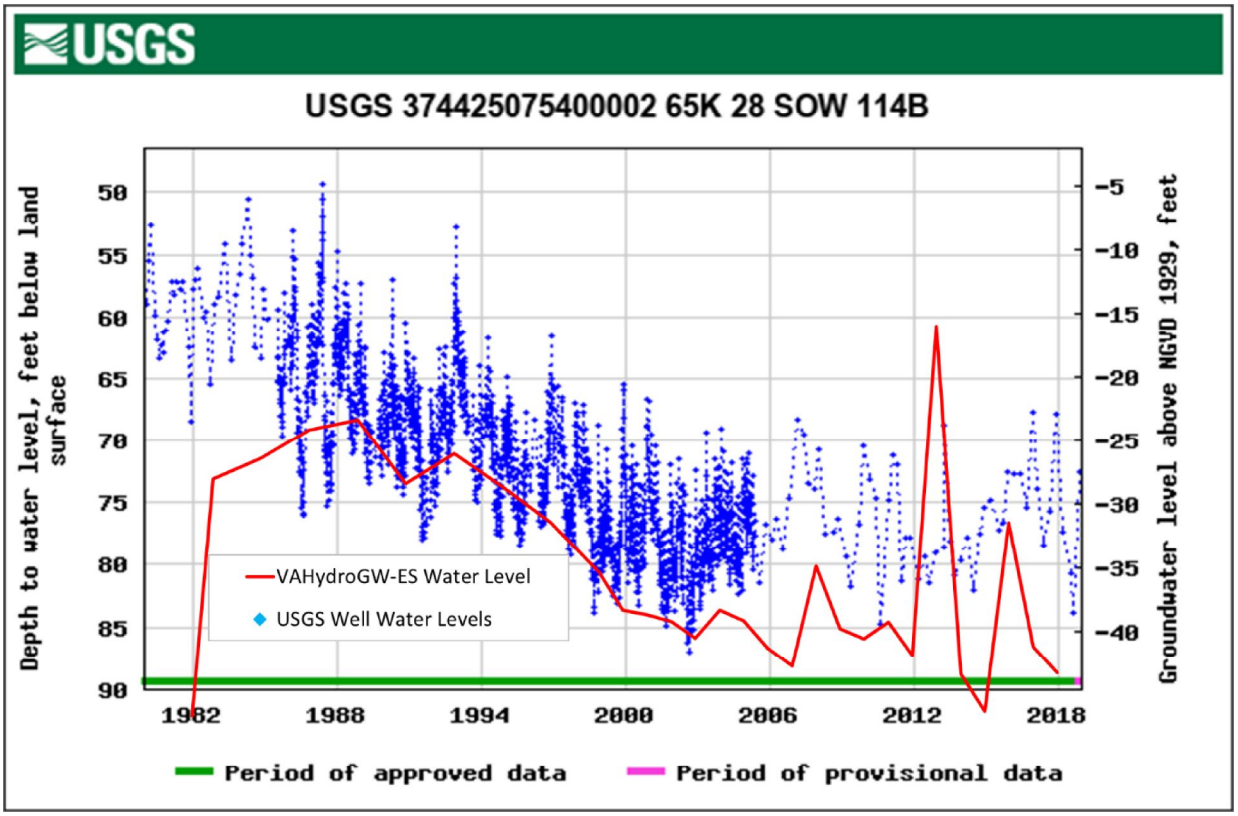


Figure 6. USGS Regional Observation Well 65K 28 SOW 114B, Middle Yorktown-Eastover aquifer water levels recorded from 1980 to present (well depth 230 ft bls, land surface 45 ft msl).

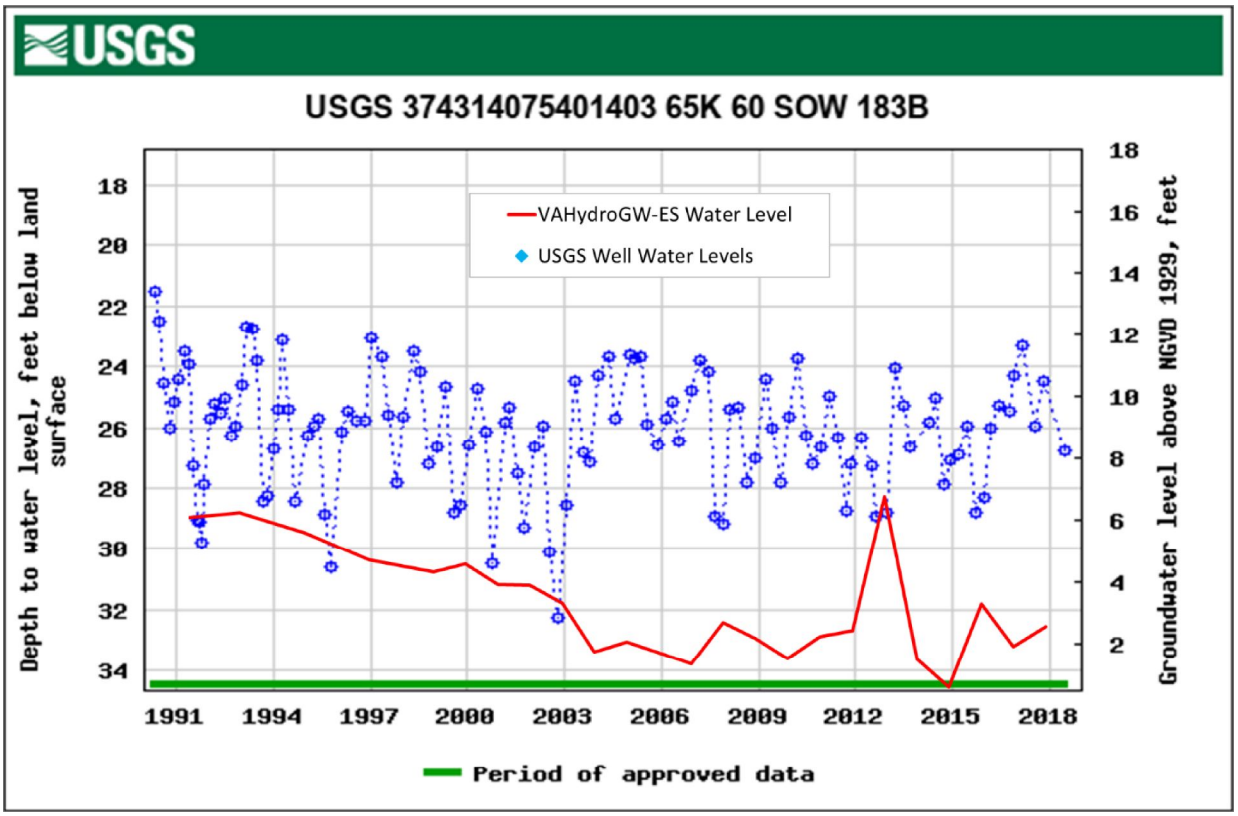


Figure 7. USGS Regional Observation Well 65K 60 SOW 183B, Middle Yorktown-Eastover aquifer water levels recorded from 1990 to present (well depth 235 ft bls, land surface 35 ft msl).

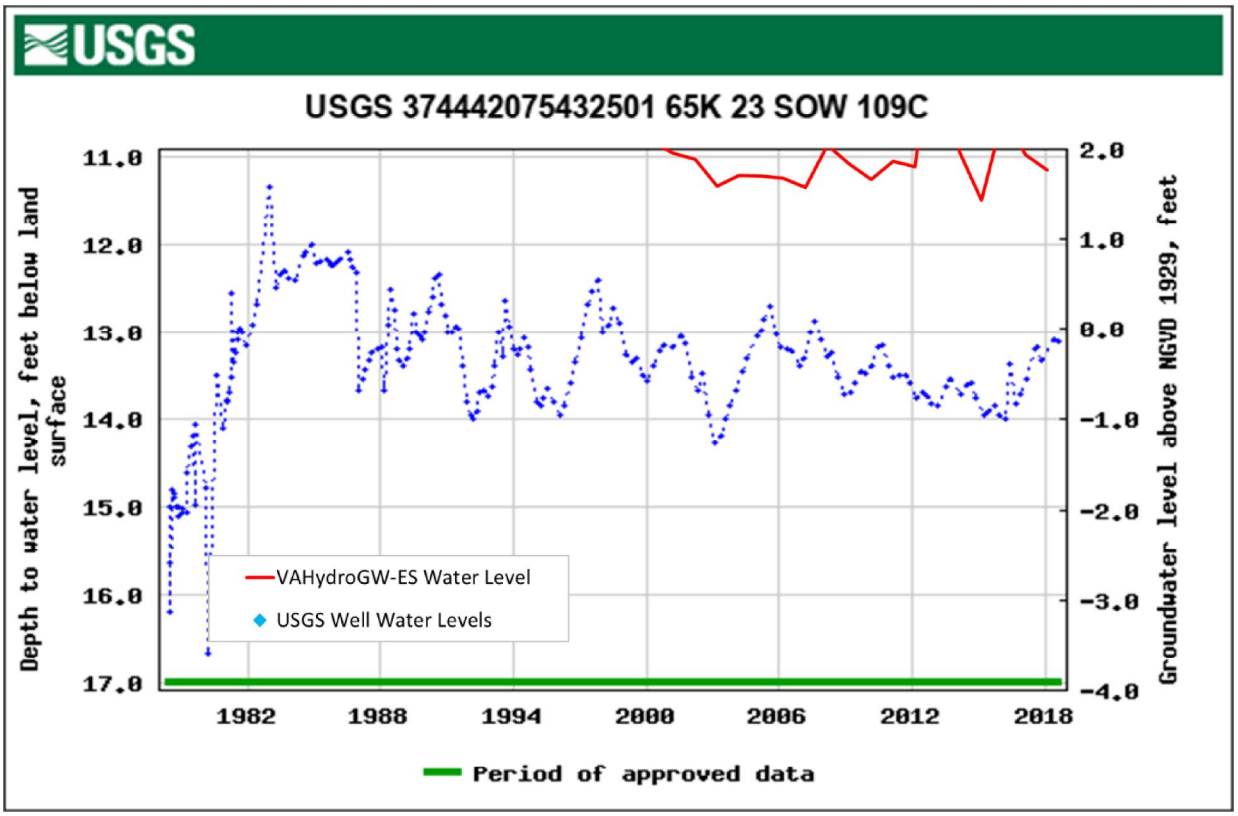


Figure 8. USGS Regional Observation Well 65K 23 SOW 109C, Lower Yorktown-Eastover aquifer water levels recorded from 1978 to present (well depth 290 ft bls, land surface 13 ft msl).

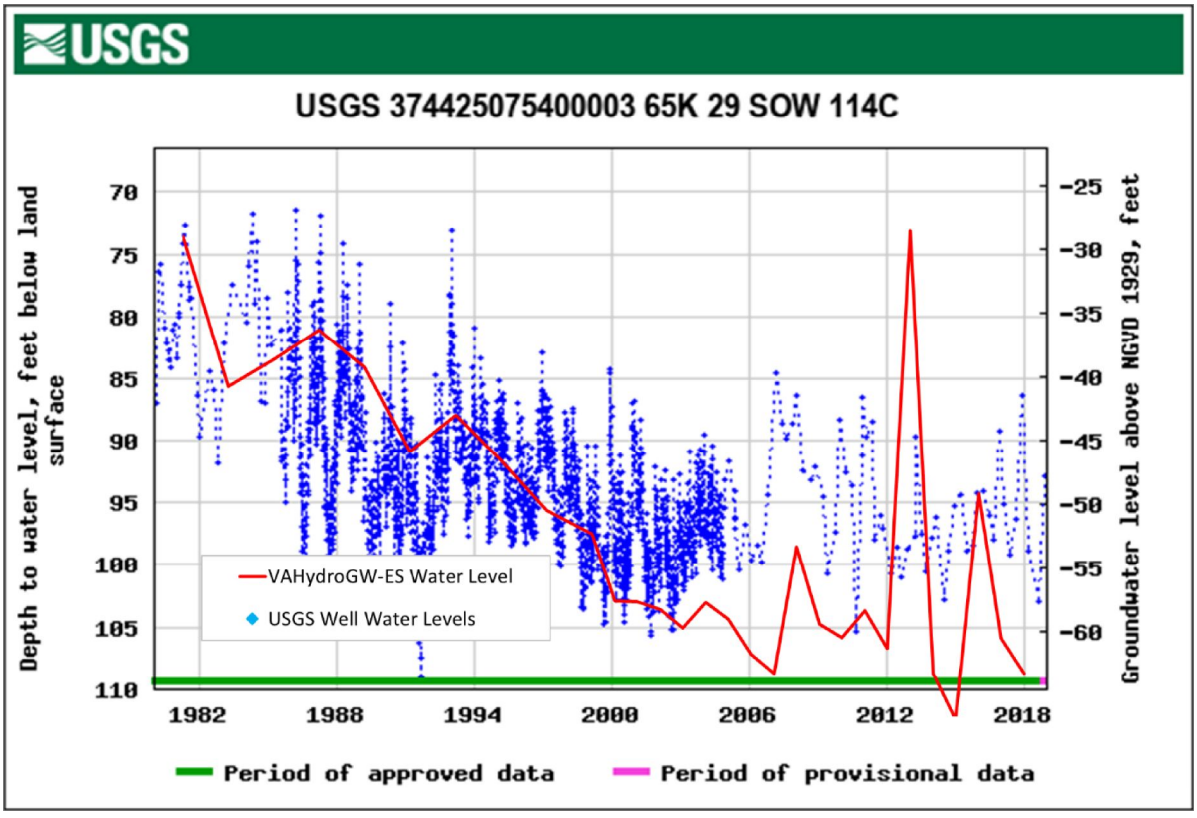


Figure 9. USGS Regional Observation Well 65K 29 SOW 114C, Lower Yorktown-Eastover aquifer water levels recorded from 1980 to present (well depth 315 ft bls, land surface 45 ft msl).

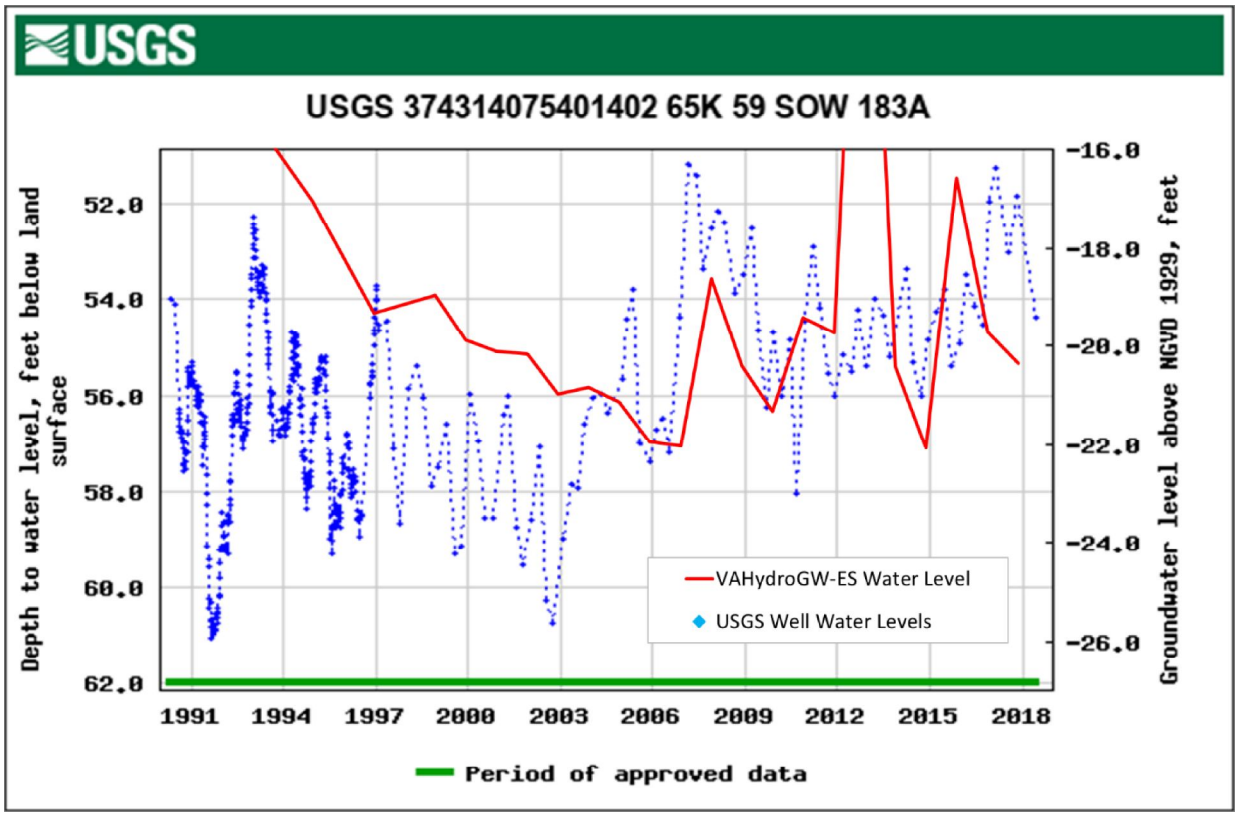


Figure 10. USGS Regional Observation Well 65K 59 SOW 183A, Lower Yorktown-Eastover aquifer water levels recorded from 1990 to present (well depth 285 ft bls, land surface 35 ft msl).

Aquifer Test(s):

An aquifer test has not been conducted for this system and the VAHydroGW-ES model parameters were used to evaluate the application. The following table provides the average hydrogeologic properties assigned to the VAHydroGW-ES cell(s) containing the applicant wells.

Virginia Eastern Shore Model Hydrogeologic Properties: Row 127/Column 39 & 40							
Aquifer	**Top Elevation (feet msl)**	**Top Elevation (feet bls)**	**Aquifer Thickness (feet)**	**Horizontal Conductivity (feet/day)**	**Vertical Conductivity (feet/day)**	**Specific Storage (1/feet)**	**Specific Yield**
Columbia	29	0	48	60	0.5	0.00001	0.15
Upper Yorktown-Eastover	-79	108	44	2	1.3	0.000004	N/A
Middle Yorktown-Eastover	-145	173	31	12	15.1	0.000004	N/A
Lower Yorktown-Eastover	-202	231	81	9	8.7	0.000004	N/A

Model Results

Evaluation of Withdrawal Impacts:

Due to the simulated single aquifer impacts associated with the proposed withdrawal, and because an aquifer pump test was not performed, the properties from the VAHydroGW-ES were used to simulate the potential drawdown resulting from the proposed withdrawal. The drawdown in the Upper Yorktown-Eastover aquifer resulting from the proposed withdrawal was calculated using a Hantush and Jacob (1955) 2-D analytical simulation. The Hantush and Jacob simulation simulates drawdown in a leaky aquifer assuming constant discharge from a fully penetrating well and most closely simulates the aquifer properties observed in the

Eastern Shore area. The Upper Yorktown-Eastover aquifer hydraulic conductivity and specific storage were multiplied by the VAHydroGW-ES aquifer thickness (44 feet) to obtain the aquifer transmissivity and storage coefficient used to simulate drawdown. The average Upper Yorktown-Eastover confining unit thickness and vertical hydraulic conductivity values for the cells containing the applicant wells are 60 feet and 0.000653 ft/day, respectively. These values were used to calculate an Upper Yorktown-Eastover inverse leakage factor (1/B). For the 2-D analytical simulations the following parameters were used:

Upper Yorktown-Eastover Aquifer Model Input Parameters: (Hantush and Jacob 1955 solution based on aquifer parameters obtained from the VAHydroGW-ES)

Transmissivity = 88 ft^2/day
Storage Coefficient = 1.76 x 10^{-4}
1/B = 3.50 x 10^{-4} ft^{-1}

Withdrawal rate/Simulation Time: 50 years at a rate of 9,900,000 gallons per year (27,123 average gpd) from the Upper Yorktown-Eastover aquifer. The withdrawal rate was divided equally among the applicant wells.

Model Results - Area of Impact:
The AOI for an aquifer is the area where the additional drawdown due to the proposed withdrawal exceeds one foot. The results from the Hantush-Jacob analytical simulation, with the parameters outlined above, simulate that the Upper Yorktown-Eastover AOI extends a maximum of 1.0 miles from the production center. This area is shown on the accompanying map.

80 % Drawdown:
The 80% drawdown criterion was evaluated using the VAHydroGW-ES and the Hantush-Jacob analytical simulation. A base simulation was developed to predict the impacts from all existing permits (except the applicant wells) operating at their 2017 maximum annual withdrawal limit allowed under the terms of their permit for all Ground Water Management Area (GWMA) permit holders. The base simulation used the 2018 Total Permitted pumping rates and 2017 simulated Reported Use water levels as starting conditions. The base simulation was executed for 50 years. A second simulation was conducted using the 2D Hantush-Jacob analytical simulation to simulate drawdown resulting from the applicant wells using the parameters and withdrawal rate listed above in the *Model Input Parameters* section of this report. For the baseline simulation, the Upper Yorktown-Eastover aquifer VAHydroGW-ES cells containing the applicant wells simulated an average potentiometric water surface of 6.3 ft-msl. The analytical simulation simulated a maximum drawdown of 22.5 feet.

Subtracting the maximum drawdown simulated in the analytical simulation from the simulated water level in the baseline VAHydroGW-ES simulation at the cells containing the applicant wells results in a simulated water level of -16.2 ft-msl for the Upper Yorktown-Eastover aquifer. This approach for simulating the potentiometric surface elevation is the most conservative for the resource. The elevation of the Upper Yorktown-Eastover aquifer top at the VAHydroGW-ES row 127/column 40 is -79 ft-msl. The 80% drawdown requirement allows the potentiometric surface (based on the critical surface elevation calculated from the VAHydroGW-ES data) to be reduced to -59.5 ft-msl in the Upper Yorktown-Eastover aquifer at the cell nodes nearest the applicant wells. Therefore, the water level in the source aquifer is not simulated to fall below the critical surface.

Additionally, the Upper Yorktown-Eastover aquifer AOI does not contain or intersect any VAHydroGW-ES cells simulated to have a potentiometric water level below the 80% drawdown requirement. No new VAHydroGW-ES cells are simulated to have water levels fall below the critical surface. Therefore, this withdrawal is within the limits set by the 80% drawdown criterion.

The requested withdrawal is allocated 100% to the Upper Yorktown-Eastover aquifer. The technical evaluation analysis indicated that the apportionment of the requested withdrawal amount among the applicant production wells had no significant effect on the outcome of the technical evaluation.

Water Quality:
The EPA has established the National Secondary Drinking Water Regulations (NSDWRs) which are non-enforceable guidelines regulating contaminants that may cause cosmetic or aesthetic (such as taste, odor, or color) effects in drinking water. The EPA recommends the secondary standards to water systems – states may choose to adopt them as enforceable standards. The EPA NSDWRs specify the limit on chloride as 250 mg/L.

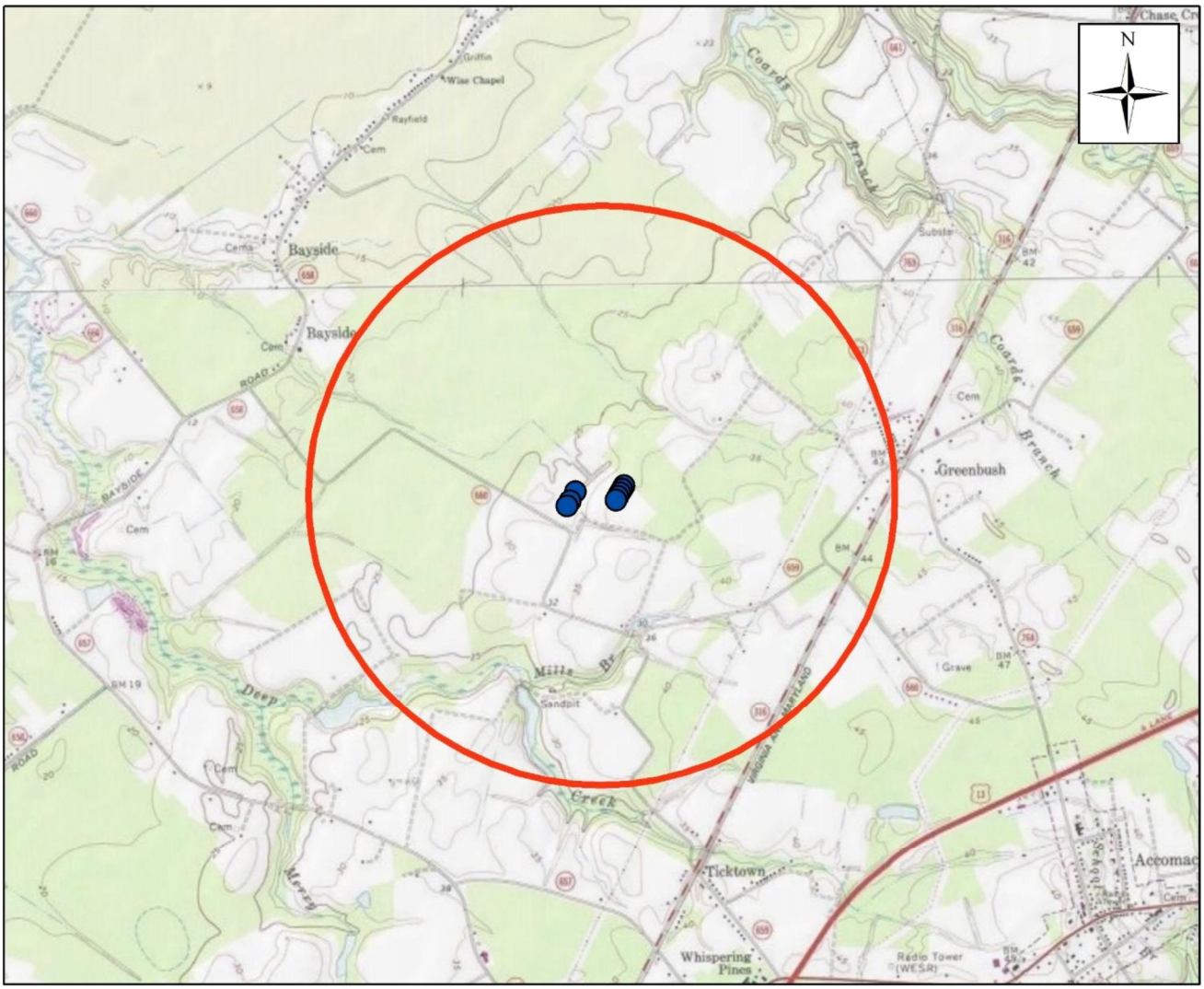
The VAHydroGW-ES was created "to help the Commonwealth and local water managers better plan water use and estimate future changes in water and salinity levels in response to changes in water use."[4] Use of the model to predict future chloride concentrations results in a "general useful understanding of system behavior, but water-resource managers must be careful in trusting the accuracy of predictions at individual wells from a regional model."[5] Further, chloride concentrations at individual wells, predicted using the regional model, should not be relied upon to predict actual concentrations at those locations.

The potential for adverse changes to water quality due to the requested withdrawal was evaluated using transient, density-dependent, SEAWAT simulations using the VAHydroGW-ES. Two simulations were executed – one simulation without the proposed withdrawal included and a second with the proposed withdrawal included. Both simulations were executed for 50 years. And both used the 2017 total permitted stresses, concentrations, and heads as starting conditions. In an effort to simulate the long-term effects on water quality due to the proposed withdrawal, the annual amount of 9,900,000 gallons per year (27,123 average gpd) was used for the duration of the second simulation. The two simulations were compared to evaluate the potential for adverse changes to water quality. The results indicated that no model cells simulate an increase in chloride concentration greater than 15 mg/L due to the proposed withdrawal. Therefore, the VAHydroGW-ES model results do not indicate the potential for reduced water quality as a result of the proposed withdrawal.

Conclusion:
The withdrawal requested by Ryan Brady for the Brady Poultry Farm withdrawal satisfies the technical evaluation criteria for permit issuance. The AOI for the Upper Yorktown-Eastover aquifer is shown in the following map. There are no existing permitted wells located within the applicant's AOI.

[4] Sanford, W.E., Pope, J.P., and Nelms, D.L., 2009, Simulation of groundwater-level and salinity changes in the Eastern Shore, Virginia: U.S. Geological Survey Scientific Investigations Report 2009–5066, 125 p.
[5] Sanford, W.E. and Pope, J.P., 2009, Current challenges using models to forecast seawater intrusion: lessons from the Eastern Shore of Virginia, USA. Hydrogeology Journal (2009), Volume: 18, Issue: 1, p: 73-93

Brady Poultry Farm
Area of Impact - Upper Yorktown-Eastover Aquifer



Brady Poultry Wells

Upper Yorktown-Eastover Aquifer Area of Impact

0 0.25 0.5 1 Miles

Simulated drawdown at or exceeding one foot in the Upper Yorktown-Eastover aquifer resulting from a 2-dmensional Hantush-Jacob (1955) analytical simulation of 9,900,000 gallons per year (27,123 average gpd) for 50 years from the Upper Yorktown-Eastover aquifer.

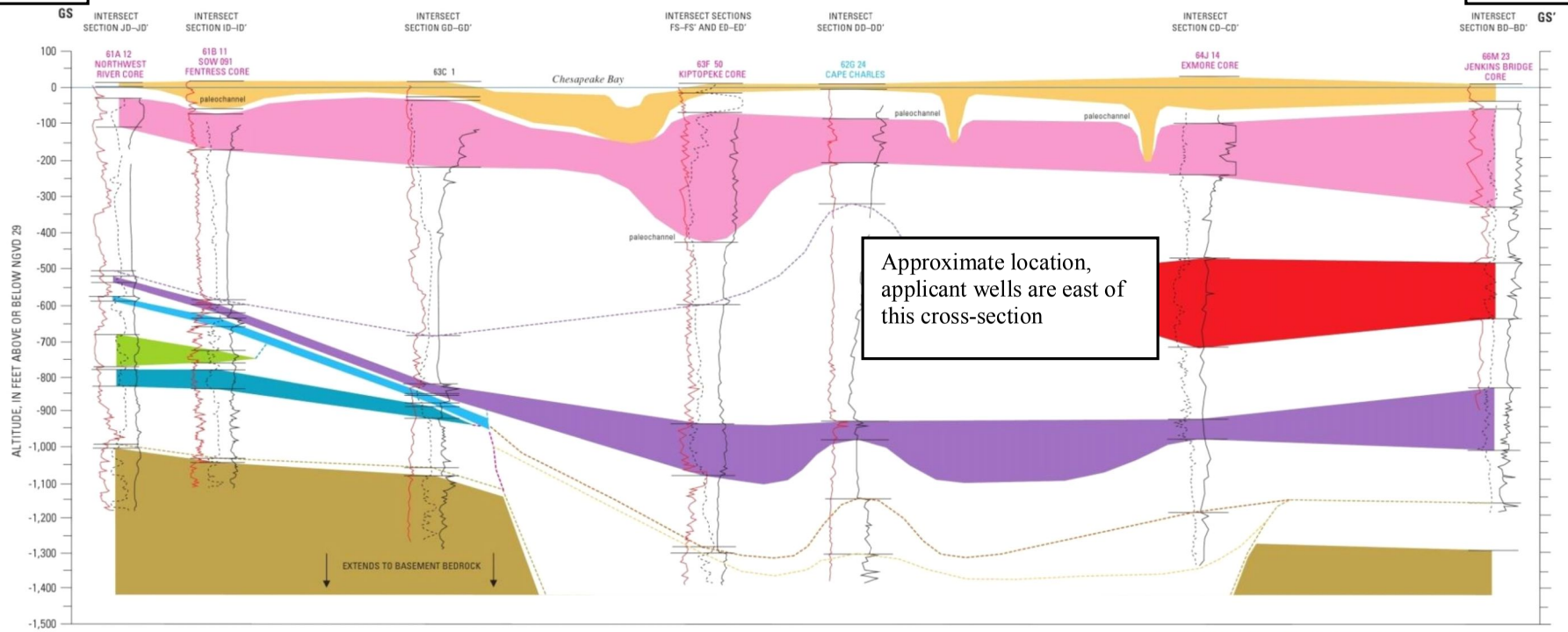
Maximum radius of one foot drawdown (Area of Impact) extends approximately 1.0 miles from the pumping center.

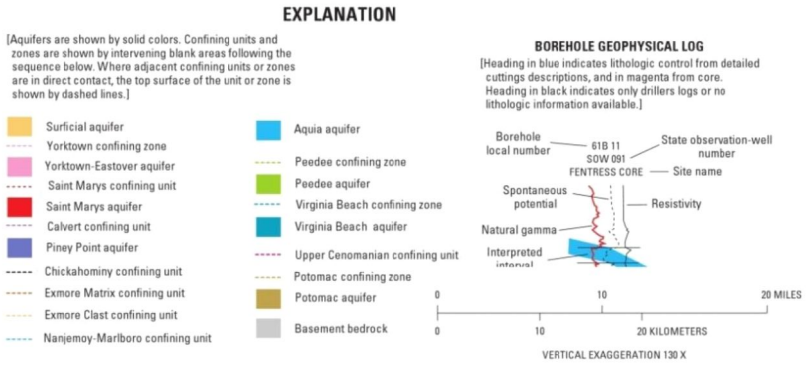
Technical evaluation performed by Aquaveo, LLC for the Virginia DEQ, Office of Water Supply
December 14, 2018

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

SOUTH

NORTH





Reference location of cross-section above

Coastal Plain (2006) Cross-Sections GS-GS' from USGS Professional Paper 1731.